SCIENCE

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CONTENTS:

The American Association for the Advancement of Science:—

Section I., Social and Economic Science: DR. JOHN FRANKLIN CROWELL..... 281

The Astronomical and Astrophysical Society of America: DR. W. S. EICHELBERGER.... 296

Scientific Books:—

Binet's Année psychologique: PROFESSOR E. B. DELABARRE. *Le Double on the Variation of the Cranial Bones:* PROFESSOR THOMAS DWIGHT 298

Scientific Journals and Articles..... 303

Societies and Academies:—

The Geological Society of Washington: ALFRED H. BROOKS. *The Chemical Society of Washington:* A. SEIDELL. *Massachusetts Institute of Technology Geological Journal Club:* G. F. LOUGHLIN. *Section of Biology of the New York Academy of Sciences:* PROFESSOR M. A. BIGELOW. *The Torrey Botanical Club:* DR. F. S. EARLE... 304

Discussion and Correspondence:—

Convocation Week: PROFESSOR J. H. LONG, DR. MARCUS BENJAMIN, PROFESSOR JAMES E. RUSSELL, PROFESSOR C. M. WOODWARD. *Professor Metcalf's Evolution Catechism:* O. F. COOK. *The Animal Parasite supposed to be the Cause of Yellow Fever:* DR. J. C. SMITH..... 309

Special Articles:—

A Fish New to Florida Waters: DR. H. M. SMITH. *Note on a Rubber-producing Plant:* WILMATTE PORTER COCKERELL.... 314

Botanical Notes:—

Progress in Forestry Instruction; An English Edition of Schimper's Plant Geography: PROFESSOR CHARLES E. BESSEY.... 315

Scientific Notes and News..... 316

University and Educational News..... 320

MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. SECTION I, SOCIAL AND ECONOMIC SCIENCE.

THE St. Louis program comprised four regular sessions, in addition to that of the delivery of the retiring vice-president's address by Mr. H. T. Newcomb, on 'Some Recent Phases of the Labor Problem' (SCIENCE, January 8, 1904). This address was made the basis of discussion at the first regular session, which was occupied with papers and discussions on the labor problem generally. The second session, on economic aspects of the new agriculture, was held jointly with the Society for the Promotion of Agricultural Science. The third session dealt with the status of instruction in social and economic science in schools, colleges and universities; and the fourth included papers on commerce, finance and government. All the sessions were presided over by Hon. Simeon E. Baldwin, of the Yale Law School, New Haven, Conn. The other officers were as follows:

Secretary—John Franklin Crowell.

Councilor—Marcus Benjamin.

Sectional Committee—Simeon E. Baldwin, vice-president, 1904; John Franklin Crowell, secretary, 1904–08; H. T. Newcomb, vice-president, 1903; Frank H. Hitchcock, secretary, 1903; E. L. Corthell (one year), Carroll D. Wright (two years), B. E. Fernow (three years), Frank R. Rutter (four years), Wm. R. Lazenby (five years).

Member of General Committee—Allen Ripley Foote.

The following papers were contributed:

Functions of Forestry in the New Agriculture: Thos. H. Sherrard, Bureau of Forestry, Department of Agriculture, Washington, D. C.

Mr. Sherrard's paper dealt with the problem of forest culture, as it related to farming rather than to lumbering, and showed the work of the Bureau of Forestry to this end. Instead of a struggle to win tillable land from the forests the farmer is more often confronted with the difficulty of obtaining building material for his house and wood for his home use. With the growing appreciation of the urgent need for forest preservation, the demand for better methods for handling wood lots to secure their permanency takes a more and more important place. How important is conservative management of wood lots from the standpoint of national economy may be seen from the fact that from one third to one half of the forests of this country are in the hands of farmers. In the new agriculture, the spirit of which is to use every part of the land, forestry has an important place. Just as the new agriculture requires the highest possible production along other lines, so with equal reason it demands that the wood lot should be managed to produce as much wood as possible. The Bureau of Forestry in the Department of Agriculture in the past five years has introduced practical forestry upon over a million and a half acres of private forest land, with applications for assistance covering five and a half million acres.

In principle forestry is an exceedingly simple matter, but its application requires the trained man. The warp and woof of forestry is silviculture—the science of guiding forest growth so that it will best meet the individual need.

The manner of treating these applications involves an examination of the tract by an agent, a report on the same and a recommendation of a working plan if deemed advisable. The Bureau makes the working plan. In the case of large tracts the expense of the field work, necessary to the preparation of the working plan, and the cost of its execution, is borne by the owner. In the case of wood lots with an area not exceeding two hundred acres, the expenses are borne entirely by the Bureau. The purpose of the woodlot work is twofold. *First,* to assist the individual owner, in applying such management to his woodlands as will make them most productive and profitable. *Second,* to encourage, by examples of forest management, a more general understanding of the simple principles underlying forestry. In almost every case owners have asked help of the bureau, because they have a very definite problem of their own to solve. A large proportion of men counting on permanent ownership of their land have wished to know how and where to cut their annual supply of cord wood and such material as they require, so as constantly to improve the value and productiveness of their woods.

Improvement in Farm Management: W. H. Hays, Minnesota State Agricultural Experiment Station, St. Anthony, Minn.

Referring to the 838,591,774 acres in this country, of which 414,498,487 acres were under cultivation and 424,093,287 acres not yet under cultivation, the problem of farm management is, How can the nation and the state assist so that these separate farms and farm-houses may be so well managed that they shall not be supplanted by a system of estates with their centrally located farmsteads and their peasant-like employees? Shall our government and states provide simply higher institutions of agricultural learning to educate managers of large estates, and thus follow the present tendency to centralize industrial work under a few managers? Or shall the

government and the state aid in providing technical education to the great mass of farmers so that the practical farmer can sustain himself and maintain a strong position in life? Technically educating the whole of the farmers and making it possible for each to remain in the life-school of independent business experience, by means of consolidated rural schools, agricultural high schools and the central college—is the answer, which has been worked out to some extent so successfully in Minnesota. (See *Review of Reviews*, October, 1903.) The cost as compared with the present developing systems of schools might be larger, but the immediate economic benefit from enlarged farm production would several times over pay the increased cost.

The next problems are to accumulate the facts, the philosophies and the processes which a scheme of education should teach, and to reduce them to pedagogical form. The teachers and experimenters of America have worked out many of the details of farm management, but have not vigorously taken up the farm as a whole. The soils, the crops and the stock, and the manufacture of farm crops into finished products have been investigated as individual features. These investigations of the parts have reached that degree of development where it seems practicable to take up the problem of managing the farm as a whole. In fact, a few teachers and experimenters have in a preliminary way blocked out some of the more general problems.

There is imperative need of facts as to the relative value per acre of the several crops adapted to a given farm; the cost of labor, seeds, buildings and machinery required for each crop; the amount of its beneficial or injurious effect on the land; the time of year when it requires labor; the desirability with which it dovetails in with other crops and with the care of live stock; and the value per acre of each crop when marketed, or manufactured into meat, milk, sugar or other finished product before marketing. A knowledge of how to arrange the sequence and the proportions of the best paying crops into the most profitable combination of crop rotation with live stock is a necessity.

Economic Functions of Live Stock: CHARLES F. CURTIS, Iowa State College, Ames, Iowa.

The fertility of the soil as part of the nation's working capital returns an annual dividend proportionate to the intelligence of methods employed. However large the crop, not more than one per cent. of the soil's total supply of plant-food is exhausted by a single crop. Otherwise one generation might impoverish another completely by robbing the soil of its resources. Maintenance of fertility is secured by rotation of crops, by chemical fertilizers and by bacteriological methods. But by none of these has the virgin strength of the soil been maintained over long periods except as plant production has been associated with animal husbandry. By selling products (butter) and restoring by-products we take from the soil but one tenth of fertility lost by a grain crop. Grain growing and animal husbandry are complemental industries, the one a summer industry and the other a winter industry.

Thus the latter is necessary to furnish continuous employment for farm labor throughout the year, the demand being greatest during the winter months when there is a cessation of field work, and lightest during the summer when the field work is most exacting. The live stock industry is, therefore, admirably adapted to supplement grain growing in its labor relations.

Then again, it contributes to a more economical use of plant food that may be

added to the soil through feeding stuffs than by any other means. If fertilizing material must be bought for the farm, it can, under all ordinary conditions, be bought in vastly cheaper form as feed stuffs and utilized as such, and the residue applied to the soil, than by purchasing fertilizers outright. The very best of fertilizers are often obtained in this way without any direct outlay. The use of feed stuffs, rich in fertility, may even return a handsome profit as a separate proposition, and thus fertilizing constituents come on to the farm under most advantageous circumstances. The British and the European farmers buy large quantities of our flaxseed and corn by-products. They figure that they are the gainers even if they do not make any profit on their feeding operations with these products, and they are. Until recently the packing house by-products, including dried blood and tankage in various forms, have practically all gone direct to the land as fertilizers. Today these products are serving a most important purpose as feed stuffs, and the time is near at hand when practically every pound of this material will first be utilized as stock food, and later returned to the soil. The returns are so much greater and so much more economical in this way as to put the purely commercial fertilizer farmer out of business in the space of a few years at the outside, where other conditions are similar.

It is true that fertilizers can not all be bought in the form of stock foods. In some cases it may not be practicable to combine stock raising with the system of agriculture being practised. These conditions are the exception, however, and they do not apply to the distinctive and most productive agricultural regions of our country.

If the seven southern states that annually expend $20,000,000 for commercial fertilizers, would stock their farms, feed their cottonseed meal, instead of exporting it, buy other feed stuffs rich in plant food, rotate with the legumes and practise the best known methods of cultivation in soil tillage, they would in a short time be independent of the fertilizer dealers, and save the vast expenditure which is now such a drain upon the resources of that section of country.

The information, which has gone out recently with scientific endorsement from high authority, to the effect that soil fertility may be maintained indefinitely without resort to fertilizers of any kind, might be viewed with grave alarm if it were to be taken literally. Likewise the doctrine that the deficiencies in soil constituents must be determined by chemical analysis and supplied by chemical fertilizers is equally pernicious. The manifest tendency in regions where farmers rely upon commercial fertilizers, like the tendency where men rely on stimulants, is to use them to excess, and when they are not necessary or profitable.

Agricultural Economics: H. C. Taylor, University of Wisconsin, Madison, Wis.

"The modern farmer produces primarily for the market. This is the chief characteristic of modern commercial agriculture as distinguished from the self-sufficing agriculture of earlier times. * * * The well-being of the modern farmer does not depend, therefore, upon his capacity to produce for himself the things which he wishes to consume, but upon his capacity to win profit in agricultural production. To win the largest net return is then the goal of modern commercial agriculture; and if the economist wishes to make himself useful to the farmer he should undertake, first of all, to solve this problem." This principle was applied to the selection of land, to the selection of crops for the field system by groups of competing and

non-competing crops, to the size of the farm best suited to the farmer, and to the questions of ownership, tenantry and forms of rental.

Where intensive culture is desired, the renting of land on the shares naturally gives way to a cash rent system which requires careful regulation if the best interests of all are to be conserved. As competition for the use of land grows more and more keen all of these questions become of vital importance to the farmer, and of real significance to the country as a whole. The study of the past experience and present practises of older countries, England and Germany, for example, is helpful; but it is of vital importance that the student of these problems be thoroughly familiar with conditions at home.

Evolution of Agriculture in the Middle West and its Social and Economic Significance: EUGENE DAVENPORT, State College of Agriculture, Urbana, Illinois.

This paper, after describing agricultural conditions in the west and pointing out radical changes both in the farm and in the farmer, concluded as follows:

1. Agriculture is eminently profitable and the farmers are not to be reckoned as among the poor of the earth.

2. Farming, as now being organized, is not exhausting the fertility of the soil, but is on a permanent basis and, therefore, the future of the industry and its people is practically assured.

3. That it is raising the value of lands at a rapid rate, thus making the man and not the acre the unit of farm value, the acre being worth its capitalized income.

4. That it is becoming too difficult an occupation, especially on the better lands, for men of inferior ability lacking in special knowledge and training.

Relation of the Family to the Labor Problem: REV. JOHN W. DAY, Church of the Messiah, St. Louis, Mo.

We must recognize the importance of the part played by the home in the making of the labor problem and the influence it may have in the working out of the problem. The reply made by John Mitchell to the inquiry whether the 'lives of the wives and children' of the men he had condemned as traitors to the laborers' cause because they worked independently of the union, ought to be made unendurable, was:

'I think those wives and children had better ask their fathers.'

In this significant reply there is the assumption of a superior loyalty than that to the family. The union claimant asserts therein that the real interest of the family lies in absolute subordination to the union. The union disclaims responsibility for any harm that may come to the outside family through its action. The welfare of the family can only be considered through its subjection to the union organization. 'Let the fathers answer that question' means that the family can not command their central loyalty, that the union acknowledges no duty to the family as such, but only to the family as a part of itself. The union thus becomes the modern feudal lord whose protection the family must obtain in vassalage and may disregard only at its peril.

It is obvious that where this principle is accepted the influence of the family in the unionist conflicts will be to sharpen feeling and heighten purpose. A motive stronger than loyalty to a class, stronger than trade fidelity, stronger than patriotism, is thus vitally connected with any cause the union may espouse. This must be an unreasoning attitude, and must have the unequaled force of sentiment. The association of ideas is immediate and inseparable, and the strength of the union must be

multiplied by the family feeling existing among its members. The potency of the feeling thus intensified is incalculable. It must always be borne in mind in estimating the power of the union.

As this is one of the strongest bonds of union loyalty, so it is the most serviceable weapon of defense and attack. The social expression of the boycott is the evidence of this. So entirely are the currents of family feeling identified with union loyalty that even when the family is divided against itself the stream often follows the union branch rather than the family direction. A mother whose son lay dead in her house could declare without compunction that it served him right to be killed for working outside the union. The compulsion of family interest forces compliance where personal interest alone would not avail. This leverage, when possessed by the union, is of mighty and varied application.

Nor does the suffering borne chiefly by the family in protracted strikes seem to counteract this tendency. Those who have been nurtured in the atmosphere of the unionized family are likely to endure hardship in the spirit of martyrdom, and the blows of pain but weld a firmer bond of sacrificial devotion. Whatever protest there may be is absorbed by a loyalty tried as by fire.

Only the last pinch of necessity can compel yielding for the sake of the family, and such compulsion does not modify the intense feeling which springs from the amalgamation of the sentiment of home protection with union preservation.

The modifying influence of the family in the conflicts of labor unions with employers is chiefly to be found in connection with non-union labor. When wives and children ask fathers who have decided that they have the highest right to the exercise of industrial liberty whether their lot is to be made unendurable, the answer is likely to be one that unionists will not hear with indifference.

What considerations specially warrant the expectation that this modifying influence will be increasingly potent?

The elevation of the family into a position of central interest is a feature of the times. The wider range of comforts within reach of industrial families; the influences of refinement and culture through public school education, through libraries and by the press; the multiplied points of contact between families hitherto socially separate, of which the social settlement work is a remarkable manifestation and a sure prophecy; the stimulus to family pride through the operation of the principles of modern democracy; the intrinsic purifying of the family ideal, of which even its apparent contradiction in freedom of divorce is partly an evidence, since in spite of license and often by means of liberty the welfare of the family does not suffer and even improves so far as it is given a natural rather than an artificial root; the suggestions conveyed more imperatively through family influences than by any other toward thrift, good habits, and affectionate ambitions; these are influences which, when gained by independent industry, will work mightily toward mitigating the constraints which hamper true industrial development.

They are influences of intrinsic primacy and, while held in check by an arbitrary and mechanical structure, which lacks some of the essential elements of vital organization, they will inevitably gain their legitimate ascendency and compel reconstruction.

Let the laboring man see the real preeminence of the family, and value at its possible worth his own fireside, let the family be made by all the helps of civilization such that he must see its supremacy, and he will have a rallying cry

for a new reformation. When the welfare of their wives and children really becomes the chief concern of their supporters, the unions whose leaders insolently claim infallibility of judgment and indisputable rights of disposition will learn over again the lesson long ago forced upon an intolerant and intolerable ecclesiasticism.

They will learn that the natural rights of man are first in right, and will at the last be first in fact, that nothing can stand against the right and duty of a man to exercise his private judgment, to work out his own industrial salvation, and to set before every other loyalty the loyalty to the highest and most sacred of human obligations.

Mutual Insurance for Prevention of Strikes: EDWARD ATKINSON, Boston, Mass.

It is commonly believed that laborers are organized, using that term in its application to working people, male and female. This assumption is without any foundation in fact. There are to-day over 30,000,000 male and female working people, including farmers and farm laborers, earning their living for compensation in money, or, according to the common expression, mostly 'wage earners.' They are, as a body, without organization. On the other hand, a small fraction have organized what are commonly called trades unions.

It is not probable that five per cent. of the working people of this country belong in all these unions combined. They are not federated or organized for any common action and as they rarely fail to antagonize one another they may be said to represent the disorganization of labor rather than its organization. On the other hand, large amounts of capital are organized in corporations, trusts and combinations.

It is not to be inferred from this statement that any exception is taken to the organization of trades unions. They are a natural outcome of modern conditions of industry and are due in a large degree to the displacement of the individual manager of mills and workshops by the corporations. Trades unions are schools, but they are as yet primary schools, in the study of social economy. As their members become individually more and more competent to manage their own affairs, they cease to adopt violent and aggressive methods; they witness more and more the evils of strikes and boycotts, and they are now passing into the next stage above the primary school, which will by and by qualify them for the high school course in the organization of labor.

Neither is it intended to affirm that all capitalists or greater employers act with intelligence in dealing with workmen. Strikes, boycotts, violence, force and lockouts are often indications of the ignorance on the part of workmen and of ignorant capitalists. Therefore they are evil. They have destroyed the harmony or community of interest which in the nature of things exists in the relation of labor and capital, which harmony and community of interest can only be disturbed by lack of intelligence on the part of laborers and capitalists alike, one or both.

Is there any way in which the necessary harmony between capital and labor can be brought into effect by capitalists and workmen? Possibly there may be. Manufacturers and employers of labor in many branches of industry and in many parts of this country are now planning to combine for mutual insurance against a loss by strikes. When a great factory of any kind is stopped by a strike, what are called the fixed charges run on; only the wages are saved. The officers, the heads of departments, many of the highest class of employees, who seldom belong to a trades union, must be continuing the service and

must be paid. The taxes, the general expenses and the cost of insurance and other charges continue.

In a rough-and-ready way one may take as a standard proportions which are almost an example of general average. We find the cost of materials which are converted in the factory or workshop into finished forms ready for final sale comes to fifty or sixty per cent. of the total cost of the finished product. The fixed charges come to about five per cent. The wages of the workmen come to from twenty to thirty per cent., seldom more. The plan for this organization of capitalists is that each shall make a small annual contribution or premium, so called, to a mutual insurance company, which shall assure to each member so many dollars during the term of a strike, at the rate of about five per cent. of the value of the total product for one year. Other similar combinations prove that such an organization for mutual insurance against loss by strikes would be simple, sure and safe at a very small ratable charge each year upon each member.

It may be here remarked that the middle body of non-union workmen, the most competent and capable of the number, may be the victims of a lockout on the part of the employers or of a strike on the part of the union. They may be ground between the upper and the nether millstone, with no fund except their own savings, and with no organized body to protect them by legal or other service against the abuses either of the employers or of the unions. As the oppression of trades unions has become plain, we witness what may be called the beginning of an organization of free laborers in many parts of the country. Workmen are now combining to bring to the support of their individual rights the funds that they may subscribe, and to do what is yet more important, to organize and direct public opinion in support of the free laborers.

What next? It would be a very plain and simple work for the corporations or individual owners of capital, who are now organizing and combining for mutual insurance against loss by strikes, to call upon the non-union workmen or free workmen of the country to join in that organization —each workman to contribute such small premium as will be required and to assure to himself such number of dollars a day as his contributions will warrant during the term during which the free laborers are deprived of work by the strike on the part of the trades unions. If this organization of labor and capital for mutual insurance and support were once established, many of the workmen, who are now joined in the trades unions because there is no other place where they can go, would leave them to join the mutual union of the free laborers and the free employers. In this way the antagonism of laborer and capitalist would be displaced by the mutual service of labor and capital.

When Labor is King: Alisan Wilson, Washington, D. C. Read by title.

Status of Social and Economic Science in High Schools: W. J. S. Bryan, Principal, St. Louis High School.

To ascertain what work is done and what estimate is placed by high school men upon the value of the study of social and economic science in high schools, letters were written to the principals of seventy-five representative high schools. They were asked to answer four questions:

1. What instruction in social and economic science is given in your school?

2. In what grades is such instruction given?

3. How many pupils are engaged in such study?

4. In your opinion what is the value of such instruction and what should be its place in the course of study of secondary schools?

Answers were received from fifty-six schools. Replies to the first question show that in twenty-one schools no instruction is given; that in twenty-one, political economy is taught; in four, civics; and that in nine, such instruction is given only incidentally.

The amount of time given to such study is forty weeks in thirteen schools; twenty weeks in fifteen schools; ten weeks in two schools.

From the answers to the second question it is learned that in twenty-one schools instruction is given in the fourth year; in ten schools in the third and fourth years; in three in the third year; and in one in the second year.

In the fifty-six schools named instruction in social and economic science is given to 1,152 pupils specifically, and to 2,681 incidentally.

The fourth question elicited interesting replies. From these expressions of opinion it appears that there is considerable diversity of views, ranging from pronounced disapprobation to emphatic approval. Twenty-four are of the opinion that it is a very valuable subject, second to none. The general opinion favors the last year of the four years for the study, on account of maturity of the pupils and their awakening interest in the problems of the day, and also on account of their previous acquisition of knowledge essential to apprehension of the present stage of civilization, domestic, economic, political, religious, educational.

The great service of social science will be the discovery and statement of the laws of association in obedience to which men may live together in a state of freedom and attain the fullest individual development. In the secondary schools originality of thought is not to be expected. To rediscover and verify and apply the laws discovered and announced by science of every kind is the immediate task of secondary pupils. More they must not be expected to do. The complex social organism with its fivefold execution, the family, society, the state, the church, the school, furnishes a subject of study that demands sustained attention, concentration of mind, apprehension of principles, familiarity with history. If this study of institutions be undertaken late in the course, when the effect of previous years is apparent in power of concentration and the vigor of grasp, it may be made extremely profitable. It is only by a study of institutional life around us that we awake to a consciousness of our relation to our material, social and spiritual environment. The world of the individual is commonly limited by sight, hearing and touch. The debt of obligation to the great institutions through which he is made partaker of all the results of centuries of struggle and trial and sacrifice and suffering is not realized.

To give a youth rational conceptions of the presuppositions of present social conditions and spirituality of ideals is to render him and society a much-needed service. A teacher who is imbued with the importance of the subject will make opportunity for its introduction, but its close relation to history is apparent. The evolution of institutions is the theme of history. After a course in general history sufficient time should be given to a systematic study of the evolution of institutions whose existence conditions the life of to-day, that it may appear from what beginnings and through what modifications social order has been developed. From this study of institutions doubtless there will come a more intelligent comprehension of the process of civilization, a juster appreciation of present conditions, and a sincere and earnest desire to contribute to their betterment and to serve the cause of social elevation.

Status of Instruction in Social and Economic Science in Normal Schools: Henry W. Thurston, Chicago Normal School, Chicago, Ill.

Special reports from forty-three representative normal schools in twenty-seven different states show that ten of them have courses in sociology, seventeen in economics and twenty-two in civics.

In practise there is yet no agreement among normal school men that a course even in elementary civics—to say nothing of economics and sociology—is needed by teachers in elementary schools.

Still there is a large and influential body of opinion in favor of the study of all three of these social sciences by even those teachers whose work will be confined to the lowest grades. Some of the reasons of this opinion are:

1. Economics and civics are needed to enable a teacher to teach specific work in these subjects in the lower schools, but to teach geography, history and current events properly, the economic and political elements in these subjects being so fundamental, are necessary.

2. As the individual can not come to a knowledge of himself and his own powers except through his social relations, the teacher must know those social conditions that are fundamentally necessary to the normal development of his pupils.

3. The individual hungers for intelligence and efficiency in the world of human institutions as well as in the world of things.

4. A democratic society needs a greater and greater social and ethical efficiency on the part of all its citizens.

5. The civilization of any age tends to educate its young in the direction of its own greatest needs, hence we are in the midst of a movement toward a better social education of our children whether we will or not.

Among the more immediate steps toward better social education the following are suggested:

1. Such an agreement among normal and their tributary high schools that courses in at least civics and economics may be prescribed in one school or the other for all prospective teachers.

2. Normal schools should keep pace with other professional schools in lengthening their courses and raising the standards, including social education, for teachers.

3. Where courses can not be lengthened some way of emphasizing the opportunities and duties of teachers in the social education of their pupils must still be found.

4. There is need of greater intercommunication among normal school teachers in order that the best things in any school may become contagious in all.

Work of the College in the Formation of Social and Economic Opinion: Robert J. Sprague, Knox College, Galesburg, Illinois.

From figures comparing colleges and universities as represented by their graduates in congress, it was concluded that the university had evidently given a greater stimulus to the study of economics and social science than the college had. This result was attributed to the comparative slowness of the college in providing departments of social and economic science. College extension work was advised in the locality to establish an educational unity between town and college as to which the narrow sectarian spirit of the college and community often stands in the way. Evening classes open to adults and supported by the municipality afford excellent opportunity and present a new line of duty in smaller cities and towns especially, where such facilities are lacking. Finally, the cooperation of the newspapers is one of the most helpful agencies to the work of the

college in molding and enriching public opinion in social and economic lines. Each college should have at least a good teacher of economics and social science, who, with a good working library, could readily meet these requirements.

Status of Instruction in Social and Economic Science in Universities: J. H. HAGERTY, Ohio State University, Columbus, Ohio.

The first thing that is to be noticed is the crude, imperfect and illogical classification of the so-called social sciences. So indefinite is our classification and so imperfect our nomenclature that a layman has hard work to discover the difference between socialism and sociology, political economy and civilization, and does not know what anybody means when he says 'political science.' There are three distinct lines of instruction in most universities, but they are so confused in their classification as sometimes not to be readily discovered. These are politics, economics and sociology. Frequently all of these are classified under 'sociology,' again under 'economics' and again under 'political science.' In reality the terms 'social science' and 'political science' should never be used, but 'sociology' and 'politics' instead. A brief classification of the special sciences would bring them under the following main heads: I., ethics; II., economics; III., politics, and IV., sociology. There should be a thorough classification and an orderly arrangement of the social sciences in each university. This would give a pedagogical as well as a scientific unity to the work.

Another very important condition noticeable in American universities is a tendency toward the applied sciences, or a tendency to study the facts of human society more and to engage in less speculation about them. In political economy, for instance, investigators and instructors dwelt almost entirely on the theories and principles of the subject. Now they are recognizing that human society is a laboratory of economics and sociology and they are inclined to do laboratory work. It is somewhat different in the study of sociology, for being a very young science it is yet passing through the period of controversy, speculation and theory. An investigation of the courses presented in fifteen of the leading universities of the West, classified as nearly as could be under theoretical and applied sciences, shows that in economics the number of applied is twice as many as the number dealing in pure theory, while in sociology the ratio of theoretical to practical is that of three to one. Economics, then, is tending toward the status of a natural science based upon classified phenomena.

There is a tendency for instruction in the social sciences to fit people for the practical affairs of life. Some of the universities have gone so far as to establish schools for commercial education, especially for the fitting of students for the business world. While many of these schools or courses are rather crude or padded, they strongly indicate the trend of economic study. The time will come when men will be prepared for the business world just as definitely as they are now prepared for law, medicine, engineering or pedagogy. In the same manner the study of politics will prepare individuals for the political administration of affairs. Sociology very early began to prepare experts for the administration of charitable and correctional affairs, and this is what ought to have occurred many years ago in the study of the social sciences.

While one should not ignore the value of the study of theory or of principles, years of time have been wasted over the fine-spun theories of wages, interest, rent, value, etc., which might have been used profitably in finding out the actual conditions of human

society, bringing students in touch with the same, and thus improving these conditions.

Politicians and business men have always pointed to the economist as a speculative dreamer, and we must admit that in the past there have been sufficient grounds for such accusation. But he is rapidly emerging into a clear-headed thinker on practical affairs. And just in proportion as he demonstrates this ability he is recognized by the business and political world.

*Public Purposes for which Taxation is Justifiable**: Allen Ripley Foote, State Chamber of Commerce, Columbus, Ohio.

Taxation for absolutely necessary purposes includes legislation, administration and the judicial activities of government. The limitations of legislative powers appear in making provision for educational, sanitary, charitable and police functions.

Both custom and law have settled in quite a definite way what are necessary public purposes in behalf of these functions. But by the arts of sophistry there has appeared the claim that an authorization to perform a function implies an authorization to do whatever may be necessary to the proper performance of the function. Take the function of education to illustrate. To teach children teachers must be employed. They must have houses in which to teach. They must have books and blackboards. Materials of many kinds must be used to construct the houses. Other materials must be used to furnish them, keep them clean and warm. Does it follow that since all of these things are necessary for the proper performance of the educational function that it is justifiable for the government to raise money by taxation for the purpose of making brick, cutting lumber, making glass, making hardware, operating coal mines, equipping and operating printing and book-binding establishments, etc.? We think not. In all the government does there is a fundamental principle that needs affirming with emphatic distinctness, the application of which will correctly determine the limitation that should be placed upon legislative power in declaring what is a necessary public purpose for which taxation is justifiable. *Every function that is commercial should be performed by private enterprise.*

Everything the government may require for the performance of its functions, that is in character identical with a service that is being performed by the people for each other in their industrial vocations, should be obtained by the government by contract with private persons, firms and corporations engaged in supplying each service for private use. This will prevent the government from monopolizing any private industry, or from withdrawing the public demand from the general market. Under the correct application of this principle the government will continue to construct its buildings by contract, to buy books, supplies and coal. It will continue to contract for the transportation of mails, the lighting of streets and the transmission of intelligence. A correct application of this principle will prevent the encroachment of governments upon the domain of private enterprise, industry and commerce. Every such encroachment is a perversion of government from the fundamental purpose for which it is instituted, the promotion of the general welfare. The need of an emphatic declaration of this principle is clearly apparent when account is taken of the efforts being made in this country, mostly for purposes of political patronage and prestige, to embark municipalities in undertakings that hitherto have been conducted by private enterprise. The need of constitutional limitations on legislative power is shown

* Title of paper read by Mr. Frederick N. Judson (no copy available) and discussed by Mr. Foote.

by an opinion rendered by Judge Holmes, now of the United States Supreme Court, when requested by the General Court of Massachusetts to interpret its powers in these respects. This opinion is quoted in Judson's 'Taxation' (1903), page 426, footnote 1, as follows:

"I am of the opinion that when money is taken to enable a public body to offer to the public without discrimination an article of necessity, the purpose is no less public when the article is wood or coal than when it is water or gas or electricity or education, to say nothing of cases like the support of paupers or the taking of lands for railroads or public markets. I see no ground for denying the power of the legislature to enact the laws mentioned in the question. The need or expediency of such legislation is not for us to consider."

Services of Commercial Organizations in the Social and Economic Development of Cities: WILLIAM FLEWELLYN SAUNDERS, Secretary Business Men's League, St. Louis, Mo.

Of these organizations there are nearly a thousand in the United States. The high-grade modern business organizations, through the volunteer service of their officers and members and the paid work of their secretaries and experts, are doing work which is systematic, thorough and of great value to the purposes of science. Their fundamental usefulness is in preventing the deplorable waste of fine individual power that would occur without them, either by the dissipation of energy through lack of organization or by the friction arising from the exertion of the force along different lines of individuals having the same general purpose. They organize and systematize commercial experiences; they reduce to uniformity the variety of business practises; they apply accepted principles of trade to local conditions; they collect statistics; they promote beneficial legislation and prevent harmful legislation; they prevent litigation and waste of community energy; they mold public opinion on economic questions; they generally develop the associative efficiency of citizenship.

No commercial organization could enter practical politics further than influencing legislation, without great injury to its usefulness as a business organization, and it should lay stress upon the necessity of these organizations confining themselves to commercial work.

Some Recent Developments in Representative Government: GEORGE H. SHIBLEY, Bureau of Economic Research, Washington, D. C.

The referendum and initiative are systems whereby the people possess a right to a direct vote on legislative questions. Far-reaching results are observed by those who for years have been studying the workings of the system in Switzerland and in this country. The system is well established in several countries, is being rapidly extended, with scarcely a reversion, then only temporarily, thus demonstrating that it is part of the evolutionary process—a world tendency.

Where the people take to themselves the right to a direct ballot, the results are exceedingly important. The final power is in the people through the right to a direct ballot, by means of the optional referendum and direct initiative. It follows that the party machine or boss can no longer enact legislation. The elected representatives simply recommend. This ensures the termination of legal privilege, thereby rendering it unprofitable for monopolists to invest money in politics, thus leaving the people free to nominate and elect men who really represent their interests. In short, representative government is restored and

politics becomes a life-work—a profession, and of the highest order.

All this is seen in Switzerland where the optional referendum has existed in federal affairs for twenty-nine years, and the direct initiative since 1891.

The striking changes which this system effects are seen most clearly in the executive department of the Swiss government. The final power being in the people, has freed the heads of departments from subservience to the instructions of a party convention. Stated another way, through the optional referendum each public question goes to the people *after* it has been considered by the heads of departments and by congress, *thus leaving these officials free to recommend whatever their best judgment dictates.* They are more independent, and probably more effective, than are the officials in our mammoth private corporations, for these heads of departments are absolutely dependent for their positions on the autocratic general manager, who is a changing factor. Not so in the Swiss government. The expert heads of departments are continued in office from term to term. For the past thirty years not a member of the Swiss cabinet has been obliged to retire. Yet there is no fossilism, for changes can be made by congress, and the subordinate officers, being more independent than in private corporations and subject to promotion for ability, propose changes. Uniform accounting opens up the keenest kind of competition.

In the general field of legislation there is absolutely no corruption under the referendum and initiative, owing to the final power in the people, and as the legislators represent the people's interests, scarcely a bill is ordered to a vote of the people. In South Dakota and Oregon not a bill has yet been referred.

The order of development in systems of government is from one-man power to party government; which in the course of centuries becomes thoroughly autocratic and is the political basis of the trusts and other forms of industrial monopoly. The next higher system is the transfer of final legislative power from the party machine to the people. It is the people's rule in place of trust rule. But in framing the legislation the people act through representatives, who are uninstructed, and thereby the highest and best forms of legislation are proposed to the people, who usually accept these bills without a direct vote.

Wall Street and the Country: Charles A. Conant, Treasurer, Morton Trust Company, New York. (*Atlantic Monthly,* February, 1904.)

What is the meaning of the recent flotation of industrial enterprises in Wall Street and their significance in the economic development of the country? The offer of new financial projects is the natural result of the great fund of saved capital seeking investment, and the merits of new methods of investment must be determined by the question whether they survive the tests of time and competition. Only those can survive which have in them real elements of benefit to the community. In so far as methods of investment are diversified there is greater inducement to capital to enter the market and to place itself at the disposition of far-sighted men for productive use. Speaking of such forms of organization as the security-holding company and the voting trust and of the ultimate result of such developments, the system of the security-holding company permits far-sighted men, for instance, who are willing to postpone present dividends to future wealth, to study the needs of a growing community, and to promote its growth by building traction lines in advance of the public demand instead of waiting for such a demand to become imperative. It enables

the managers of a great trunk line to put an end to transfers of passengers at state boundaries and local terminals, and to run the palatial trains across the continent upon harmoniously adjusted schedules, which, far from being 'in restraint of trade,' have done more to promote it than all the laws for preventing combination or all the suits begun in pursuance thereof. The system of the holding company undoubtedly increases the power of the big financiers, but it enables them in many cases to go forward with far-sighted plans for meeting the certain expansion of local traffic in our imperial city, or of international traffic between the grain fields of Minnesota and the markets of Asia, which would be difficult or impossible under the old system of petty competing organizations governed by the restricted vision of some neighborhood magnate.

America has a great destiny to perform in the industrial development of the world. She can perform it only by applying to every part of the machinery of production, transportation and exchange the principle of the greatest economy of effort to obtain the greatest sum of results. The opportunity for every man to rise by his talents from the lowest to the highest place, the right to reap and hold the rewards of one's labor without excessive taxation or vexatious visitation, the privilege of transferring property on the stock exchanges without the fetters imposed on such transactions in Europe, and the freedom to extend new methods of economy and combination in trade and finance across the continent, untrammeled by local tariffs and state boundaries, are among the weapons which give our country its great advantages in dealing with older competitors.

The new methods and the new projects are going through the test of fire to-day, and some of them are being consumed. The tests which weeded out the badly organized and incompetent of the early stock companies, which drove to the wall the 'wildcat' banks of ante-bellum days, and which wiped out dividends and stock rights in badly managed railways, are now being applied to the new forms of organization which have been the growth of the past decade. But the stronger and better organized of these new corporations are likely to meet these trials without disaster or to modify their methods to conform to the teachings of experience, until there remains to the financial world a valuable residuum of new methods for giving flexibility to capital and promoting its transfer promptly and efficiently from the industries where it is not needed to those where it will render its highest service.

Social and Economic Significance of Street Railway Traffic in Cities: E. DANA DURAND, Bureau of Corporations, Department of Commerce and Labor, Washington, D. C.

This paper embodied many of the results of the census inquiry on street railways (1902), covering a period of twelve years since 1892. In this period trackage had grown from 8,123 miles to 22,589 miles. Passengers carried were about three times the world's population. In 1902 the number of rides was 170 times the country's urban population. In some of the larger cities the number of street car rides exceeded 250 per capita annually.

Among developments cited as characteristic were the substitution of electrical power, the extension of trackage outside of city limits as suburban and interurban lines, consolidation among urban lines and improvement in street railway service generally.

The social and economic significance of these agencies appears in their capacity as distributors of population to and from centralized localities, in which industries

and mercantile activities are grouped in propinquity. The street railways make possible the centralization of the retail trade, and widen the range of recreation and amusement of most people. Yet they have not reached their limits of usefulness to the artisan and the well-to-do. Too much of the time of these users is consumed on street railways and the charge is as yet too high, the average cost of carrying a passenger in the United States being 2.9 cents, not counting profits.

Discussions. The following participated in the discussion of one or more of the above papers: Lee Meriwether, St. Louis; W. M. Bryant, St. Louis High School; J. H. Scarborough, Warrensburg (Mo.) Normal School; Joseph A. Wright, St. Louis; Frederick N. Crunden, St. Louis; Carroll D. Wright, Washington, D. C.; William H. Lynch, Mountain Grove, Mo.

John Franklin Crowell,
Secretary.

Washington, D. C.

THE ASTRONOMICAL AND ASTROPHYSICAL SOCIETY OF AMERICA.

The fifth meeting of this society was held in St. Louis, Mo., during convocation week, in affiliation with the American Association for the Advancement of Science. All the sessions were held at the Central High School, where rooms were occupied conjointly with Section A.

The first session of the society was held on Tuesday afternoon, December 29, at which officers were nominated to be voted for at the annual election the next day.

On Wednesday morning a joint session was held with Section A, for the reading of papers, and on Wednesday afternoon the reading of papers was finished and the annual election of officers held.

The members of the society were served lunch at the High School by the local committee on both Tuesday and Wednesday at noon.

The meeting was the smallest ever held by the society, there being less than twenty members present. Ten new members were elected.

The officers elected were:

For 1904.

President—Simon Newcomb.
First Vice-President—Geo. E. Hale.
Second Vice-President—W. W. Campbell.
Treasurer—C. L. Doolittle.

For 1904–5.

Councilors—E. C. Pickering, R. S. Woodward.

Geo. C. Comstock and W. S. Eichelberger were elected members of the Council of the American Association for the Advancement of Science from the Astronomical and Astrophysical Society of America.

PAPERS PRESENTED.

G. W. Hough: 'The Prediction of Occultations of Stars by the Moon.'

W. W. Campbell: 'The D. O. Mills Expedition.'

G. C. Comstock: 'The Sun's Motion Relative to a Group of Faint Stars.'

F. W. Very: 'The Absorption of Solar Radiation by the Sun's Atmosphere.'

Sebastian Albrecht: 'Borelly's Comet.'

W. S. Eichelberger: 'The Pivots of the nine-inch Transit Circle of the U. S. Naval Observatory.'

M. S. Brennan: 'A Short Sketch of the Progress of Astronomy in the United States.'

H. C. Wilson: 'The Eros Parallax Photographs at the Goodsell Observatory.'

ABSTRACTS OF PAPERS.

The D. O. Mills, Expedition: W. W. Campbell.

The observing station of the D. O. Mills expedition from the Lick Observatory to the Southern Hemisphere was completed in October. It is located on the summit of San Cristobal in the northeastern suburbs of Santiago, Chile. Its elevation above the city is about 950 feet, the altitude of Santiago above sea level being 1,800 feet. The distance from the center of the city is about two miles.

The expedition is in charge of acting as-

tronomer W. H. Wright, who is assisted by Dr. H. K. Palmer.

The unfortunate delays encountered in completing the mirrors for the reflecting telescope made it unavoidable that the expedition should reach Chile at the beginning of the southern winter—the rainy season. San Cristobal was selected as the site early in June. The expedition reached Chile just a few days before the breaking out of very serious labor troubles. This and the storms of winter made the construction of the observatory on the summit one of considerable difficulty. The requirements for erecting the Warner and Swasey steel dome, the reflecting telescope, the electric power line from the valley to the summit, etc., could not be met by skilled labor obtainable in Chile, and the astronomers were called upon to supply this almost entirely themselves.

Up to October 9 spectrograms had been secured for determining the speeds of twenty stars, and ere this the number is undoubtedly much greater. At the time of writing, photographs of the dome, office building and general surroundings have not been received.

The completion of the extensive installation in the four winter months, in spite of lack of skilled assistance and the frequent interruptions by storms, together with the securing of a considerable number of spectrograms, is sufficient testimony that numerous and valuable results will be secured in the time assigned for the work.

The Sun's Motion Relative to a Group of Faint Stars: GEORGE C. COMSTOCK.

A year ago the author presented to this society a set of proper motions of faint stars (ninth to twelfth magnitude, distributed throughout the twenty-four hours of right ascension) determined from micrometric observations extending over a period of about half a century. During the past year the author derived from these proper motions a determination of the direction and magnitude of the sun's motion, using Airy's method for the formation of the necessary equations. This method requires that some assumption shall be made with regard to the distance of each star employed, and for this purpose the author used an extrapolation of Kapteyn's formula, which represents this distance as a function of the proper motion and stellar magnitude.

The author has thus derived from absolutely new data, no one of the proper motions employed having entered into any previous investigation, the following coordinates of the apex of the solar motion:

$$\text{R. A.} = 297°, \quad \text{Dec.} = +28°.$$

The mean result of previous determinations from brighter stars is

$$\text{R. A.} = 275°, \quad \text{Dec.} = +30°.$$

The present solution furnishes as the linear velocity of the sun's motion 4.8 radii of the earth's orbit per annum, which, compared with Campbell's spectroscopic result, 4.2 radii per annum, indicates that the assumed parallaxes of the stars are not greatly in error. Adjusting the assumed distances so that the resulting solar velocity shall agree with the spectroscopic determination, the author finds for the average parallax of 67 stars included between the ninth and twelfth magnitudes, $\pi = 0''.0051$.

This number, 67 stars, represents the entire amount of data at the author's disposal, no proper motion having been rejected in the discussion, but it is doubtless too small a basis for a determination of the elements of the solar motion and, at least provisionally, the author prefers to interpret the results noted above, as evidence that the proper motions obtained for these faint stars are real quantities and that the methods employed for their derivation may with advantage receive wider

application. The author has now in hand a similar determination of proper motions of all stars fainter than the eighth magnitude for which suitable data can be obtained from the earlier double star observations of the Struves.

Photographs of Comet 1903 c (Borelly): Sebastian Albrecht.

This paper gave a preliminary account of results obtained from thirty-seven photographs of the comet taken at the Lick Observatory. The photographs show that the comet had two distinct types of tails—one very much curved and short, never much exceeding a degree and a half in length, the other long, and in its general direction straight. Measures of the long tail show that its average lag behind the radius vector was less than two degrees.

The period from the 22d to the 26th of July was one of unusual activity in the comet. The plates of July 23, 24 and 26 show detached portions of the main tail, indicating changes in the emission of cometary matter from the head. From a comparison of the Lick plate of July 24 with two plates of the same date taken at the Yerkes Observatory and one taken at Nanterre, an average recession from the head of thirty-five miles per second was obtained for a detached section of the main tail. This is equivalent to thirteen miles per second relative to the sun.

The paper was accompanied by slides showing the principal features of the comet.

A more complete account of results will be published in a Bulletin of the Lick Observatory.

The Eros Parallax Photographs at the Goodsell Observatory: H. C. Wilson.

Some of the results of the measurements of photographs taken with the eight-inch photographic telescope at the Goodsell Observatory were exhibited. A rough solution of the equations derived from the best situated plates gives for the solar parallax 8″.799. Similar equations from the published results from photographs taken at the Bordeaux and Paris Observatories give for the parallax 8″.798 and 8″.794 respectively.

W. S. Eichelberger,
For the Council.

SCIENTIFIC BOOKS.

L'Année psychologique. 9me Année, 1902. Publiée par Alfred Binet. Paris, Schleicher Frères et Cie. 1903. Pp. 666.

This ninth number of the yearly publication issued from the psychological laboratory of the Sorbonne is rendered especially notable by the clear and acute analysis which M. Binet gives of the oldest of the problems of experimental psychology. His conclusions are at variance with all the prevailing ideas concerning the measurement of the threshold for the discrimination of sensations of contact. Since Weber first introduced the problem, it has been believed, and the researches of numberless experimenters have seemed to confirm the belief, that this threshold of tactile sensibility could be definitely determined, and that it was uniformly lowered by practise. M. Binet asserts that what has been measured is not the acuteness of tactile discrimination, but a manner of judging, of interpreting; that the threshold itself practically can not be determined; and that in all probability practise does not alter its real position.

The original articles in this number, of which there are three besides that just mentioned, cover 252 pages. They are followed by 255 pages of bibliographical analyses of nearly 80 books and articles; and by the international Bibliographical Index for the year 1902. Analysis of the original articles follows.

(1) P. Malapert: 'Inquiry Concerning the Feeling of Anger in Children' (pp. 1–40). This is a presentation of the results of a questionnaire sent out in 1900 by the newly founded Société libre pour l'étude psychologique de l'enfant. The author remarks upon the ambiguity of some of the questions, the

uncertainty concerning the figures given and their interpretation, and the general difficulties attaching to this method of investigation; and then discusses his facts under three headings. I., 'General Statistics': 183 observations are given, of which 141 were on boys and 42 on girls. Children of normal intelligence, of normal height and of good health are subject to anger, in even greater proportion than those less well endowed. Paleness is a frequent characteristic of anger, as well as hyperæmia, a fact neglected by many previous observers. Secretions are augmented sometimes. Innervation of the voluntary muscles is increased, but is uncoordinated and spasmodic. Tears appear at the close of an attack in a very large proportion of cases. The malign influence of heredity is very apparent. In all but 20 per cent. of the cases the attacks of anger have diminished in violence and frequency with increase in age. II., 'Different Forms of Anger; Irascible Children': Two fundamental types of anger are distinguishable, the one defensive and the other offensive, both connected with the instinct of self-preservation. Considerable space is given to the demonstration and description of the former type, which had not been recognized by M. Ribot. Children of a pronounced irascible type show the influence of ill-health and of hereditary taint more strongly than do the others. Anger is rarely due primarily to example. III., 'Pedagogical Considerations': Hygienic measures are as important as moral ones. The method of cure must be adapted to the individual nature. It is essential that some image, idea or feeling, profoundly incorporated within the mind and awakened by the very fact of the arousal of anger, should oppose the latter and dominate it. Corporal punishment is often beneficial. The application of cold water is preferable. In general, motives of an intellectual and moral nature are best of all.

2. B. Bourdon: 'On the Possibility of Distinguishing the Sensations from the Two Eyes' (pp. 41–56). It is possible to distinguish which eye receives an impression, when the impressions received by the two eyes differ in intensity, in distinctness or in the number of details. The distinction is due to a subjective phenomenon consisting in a sensation of heaviness or constraint in the eye which receives the impression less strong, less clear or less rich in details, and in a feeling of lightness or of facility in the other eye. The author believes, contrary to the opinion of Brückner and Brücke, that these feelings have a peripheral origin, being due probably to sensations from the muscles or tendons of the eye. Feebleness of retinal excitations leads to a low degree of innervation of eye muscles, involving a greater degree of effort in fixating, hence a feeling of heaviness or constraint. An objective phenomenon, consisting in a shadow accompanying the luminous point, sometimes appears. It can be shown that this it not due to excess of convergence when both eyes view the point, as has been surmised, but that it is closely related to the subjective phenomenon.

3. A. Binet: 'Writing during States of Artificial Excitation produced by Work of a Graphic Nature' (pp. 57–78). The author had previously observed in experiments on hysterical patients that in states of excitation writing became larger and its lines thicker; and in tests on school children that marks made in crossing out certain letters from a printed page became longer, thicker and more inclined when the task was rendered more difficult by habituating them to one set of letters and then giving them another group to cross out. He now tries a series of experiments on normal persons, in which a phrase is first written correctly and then rewritten with the vowels omitted or with other vowels substituted for the correct ones. The change from the relatively mechanical act of normal writing to a task involving a greater degree of attention and effort causes the letters to be written larger, better and often detached from their neighbors. The fact is accounted for probably by a more vivid representation of the letters, by a desire to make the incorrectly written letters legible, and especially by an attendant diffuse excitation of the movements of writing.

4–9. M. Binet divides his discussion on the 'Measurement of Tactile Sensitivity' into six separate articles (pp. 79–252). They all to-

gether, however, form a unitary paper, and it will be more convenient to analyze them together. The primary object of the research is an investigation into the possibility of any true measurement of tactile sensitivity.

(*a*) *Introductory Discussion; Methods.*—The different meanings of the term sensitivity are discussed. Much space is given to an account of Weber's researches, a little to that of his successors. Tawney's recent analysis of the Vexirfehler (mistaking of one point for two) is very significant, and really throws doubt on the very possibility of determining a threshold. There have been grave errors of method in all previous researches. The æsthesiometer should be one capable of exercising a known and equal pressure on both points stimulated; of stimulating them simultaneously, or, in case simultaneity is not attained, of registering the fact; and of regulating and recording the rapidity of application of the stimuli. The author describes such an instrument. The method of minimal changes is faulty in that it introduces suggestion strongly and gives the subject too slow an adaptation to the difference between the feelings attending small and large distances between the points. The threshold given by the method of right and wrong cases is a mere convention. A mixed method, that of irregular variations, is preferable. It consists in arranging a series of minimal differences, but applying them in irregular yet uniformly determined order. There is a serious disadvantage in employing as subjects laboratory students exclusively. Most important of all is the giving of full psychological indications. It is necessary to take account of the subject's degree of acquaintance with æsthesiometry, and of everything that is said and done which has any relation to the study of tactile sensitivity. It is a mistake to confine the responses of the subject to the simple words *one* and *two*, and when he is doubtful, to make him guess or to count the doubtful cases half to the correct and half to the incorrect replies. A long and minute analysis of everything that is felt should be exacted, since the states of consciousness are very complex and variable. It is essential to guard against distraction and to recognize it when it occurs; this can, perhaps, be accomplished best by requiring the subject to estimate the distances between the points. This procedure has the further advantage of furnishing a control as to the correctness of the replies concerning the number of the contacts. The author quotes frequently from his records of every word that was spoken during his sittings and of all facts that might have any possible bearing upon them, and the insights gained thereby into the intricacies of the conscious processes and into the influence of suggestions of all sorts, revealing facts to which a bare enumeration of numerical results would have given no clue, amply justify his insistence on the essential importance of such records.

(*b*) *The Simplists.*—There are certain persons who make no errors for the single point (no Vexirfehler); few errors for points separated by small distances (*i. e.*, they call them almost uniformly *one*); whose threshold is obtuse and well-defined; and who after practise lose their exact perception of the single point and begin to make mistakes. These the author calls '*les simplistes.*' Now Clavière has shown that between the definite sensation of a single point (*A*) and that of two distinct points (*C*) there exists a series of intermediate sensations (*B*) of a single contact of varying thickness. The simplists are those who interpret sensations *B* as meaning a single contact, whether or not they know that all the stimulating points are of the same thickness. The author found such among school children, who were informed in advance that only one or two stimulating points were to be used and that the number of stimulating points felt was the information desired of the subject; and among adults to whom absolutely no preliminary instructions were given, who knew nothing of æsthesiometry, nothing of the nature of the points used nor of the object of the experiment, and who, after a long series in which they had at first occupied themselves with considering the character of the stimulating object or with the thought of possible painful sensations that might be inflicted, arrived spontaneously at the idea of indicating the number of contacts that were felt. The ab-

sence of preliminary explanation or its exact nature when given has a decisive influence on the character of the replies. The threshold for the back of the hand lies between 1 and 2 cm., and this is the same as the threshold for the difference between sensations *B* and *C*, for persons who deliberately seek to make this distinction. Continued practise tends to introduce Vexirfehler—to make interpreters out of the simplists; and the difference between the more and the less intelligent subjects, at first very marked—the intelligent having a lower threshold and being more subject to the Vexirfehler—tends to diminish. It is interpretation of the sensations, especially those of class *B*, and not improvement in attention or a real lowering of the threshold, that explains these effects of practise.

(*c*) *The Results of Distraction of Attention.*—Distraction may occur when attention is strongly directed elsewhere, or when there is difficulty in fixing the attention at all. The usual method of producing it consists in having the subject execute two tasks at once. When this is tried, the resulting mental states may vary enormously in different persons: there may be an easy and rapid alternation of attention between the two tasks, and thus no distraction; or an irregular alternation, with many errors and confusions; or a fixation in one direction, in which case the second task is suspended or becomes automatic. The author had his subjects carry out long additions aloud, and made contacts when the effort of attention to the figures, as clearly indicated by the voice, was greatest. Cases where attention alternated, going actually to the contacts when they were made, without distraction, could be easily distinguished from those where true distraction occurred, and presented no differences from the normal results. Investigations were made also of cases where distraction occurred as a result of mental revery, and on account of congenital defect in backward children. The effect of distraction is to produce a systematization of the replies, showing itself in an automatic repetition of the same reply, either 'one' or 'two'; or to produce replies that are due wholly to chance. The former effect, systematization, probably characterizes distraction with fixed attention; the latter is produced during distraction with mobile attention, due either to exterior causes or to congenital weakness.

(*d*) *The Interpreters.*—The author had his own tactile sensitivity tested, adopting two mental attitudes: in the one he answered 'two' only when he was certain that he felt two distinct contacts, 'one' in all doubtful cases; in the other he sought to make an interpretation for the doubtful cases, to determine whether the sensations of class *B* were occasioned by one point or two. In the latter case he obtained a lower threshold and more numerous errors for the single contact. One of his subjects exhibited in early trials a threshold of 1.5 cm.; a year later, one of 0.5 cm., but had meanwhile become fully acquainted with the processes and results of æsthesiometry, and this fact alone accounted for the difference. In general, the interpreters, who form the majority of intelligent adults, and thus of the subjects who have been employed in researches in æsthesiometry, are characterized (1) by a lower threshold for the 'double sensation,' which signifies not a greater degree of tactile acuteness, but merely a difference of judgment, of mental attitude; and (2) by a larger number of errors for the single contact. There are very many types of interpreters—sceptical, deliberate, unconscious, etc.—of which the author describes several. True hyperæsthesia may exist, and a probable case is described. It reveals itself not merely by the ambiguous apparent lowering of the threshold, which is usually only apparent, but also by an increase in the delicacy with which the distance separating the two points can be estimated for distances lying ordinarily below the threshold.

(*e*) *Influence of Practise and Suggestion on the Position of the Threshold.*—Transform a simplist into an interpreter, and you have an apparent lowering of the threshold. The transformation may take place spontaneously, or it may be due to a suggestion, to seeing or touching the apparatus, to a knowledge that all the points are of equal thickness, to observing that two points very near together give a sensation of thickness, to an expecta-

tion that the threshold will be lowered, to a fear of making errors, to a reprimand, etc. When such influences are lacking, practise has not been found, in the experience of the author, to lower the threshold, and his results agree in this respect with those of Tawney.

(*f*) *The Threshold of Double Contact can not be Determined Scientifically.*—For a simplist there is a determinable threshold. But every simplist is a latent interpreter. The determination of the threshold is practically impossible. It varies from moment to moment, and the more one seeks it the less he finds it; and it depends so strictly on the manner of interpreting the sensations, even in the cases where it appears to have a definite position, that one can not be sure that it expresses the degree of acuteness of the organ. Even if all persons had exactly the same degree of sensitivity, apparent differences would appear.

This research is certainly of the greatest value, and no future investigation in æsthesiometry can neglect the facts that it establishes. It seems legitimate, however, to question whether the author's final conclusion is fully justifiable. May it not be possible to make simplists of all one's subjects? To determine the threshold between sensations *B* and *C*, and thus to secure valuable information concerning the relative sensitivity of different regions of the body, of different persons and of the same person at different times and under various conditions?

E. B. Delabarre.

Brown University.

Traité des Variations des Os du Crane de l'Homme, et de leur Signification au point de vue de l'Anthropologie Zoologique. Par M. le Dr. Le Double. 118 Dessins dans le texte. Paris, Vigot Frères. 1903.

A volume of four hundred pages and all on the variations of the cranial bones! Be it noted, moreover, that the word 'cranial' is used in the strict sense, and that, therefore, the facial bones are not included. Ponderous as the work may seem, it is one that will be warmly welcomed by anatomists. It will be of great value not only to those devoted to human anatomy, but to all interested in vertebrate morphology. We are glad to understand that the author intends to continue the study of the variations of the human skeleton and that we may expect next a treatise on the facial bones. His method is that pursued in his treatise on muscular variations, which is already a classic. Side lights from embryology and comparative anatomy are thrown on the questions, while the various and often contradictory views of authors are discussed. It is natural enough that the size of this work should astonish outsiders; yet even anatomists will be surprised at the number of points of variation which present themselves.

There is no possibility of reviewing such a work in detail; but let us mention a few of the points of interest in a single bone in order to show how extensive is its scope. Let us take the first bone, the occipital. We must take up the story of the development of the squamous portion, the difference between the supra-occipital and the epactal bones, the former of which is that part which develops in membrane, while the latter is merely a wormian bone, or several together. On the outside there is the torus and the very rare median crest. On the inside are the endless varieties of arrangement of the venous sinuses (which the author attempts to classify), the torcular fossa, and the middle cerebellar fossa. Here as elsewhere the author is very severe on Lombroso and his school, who, as is well known, make much of the latter fossa as a criminal feature. He exclaims: "Must we consider Scarpa a madman or a criminal because his occipital, like that of Charlotte Corday, had a vermian fossa? If a defect in the formation of the skull or of the brain is an index of mental inferiority or of a tendency to crime, how happens it that Dante and Pericles had asymmetrical skulls (with great development of the parietal), that Kant had an interparietal bone, Volta a metopic suture, Byron, Humboldt and Meckel premature closure of sutures, and Bichat one hemisphere much smaller than the other?" For our part, while we have no wish to minimize the absurdities that the followers of the school of criminal anthropology have been guilty of,

we think that the strength of their position is that the occurrence of many anomalies in the same individual, and especially the occurrence of multiple anomalies in many members of the same family, may fairly be considered marks of degeneration; that in short there is a core of truth in the system, hampered as it is by errors. This in parenthesis. The author then goes on to discuss the various theories to account for the presence of the fossa. This in turn brings up the significance of Kerkring's ossicle, which Le Double declines to consider as representing a part of the proatlas. Here we are once more in the midst of deep questions of embryology and comparative anatomy, and yet we have not finished the squamous portion alone. Later comes a discussion of how many segments the basi-occipital may represent, and whether a subdivision of the anterior condyloid foramen into two, three or even four, results from anything more abstruse than the quasi-accidental ossification of strands of fibrous tissue. There is, as every one knows, much that is interesting in the condyloid region. We could have wished that more had been said of the fusion of the atlas and occiput, but the consideration of this phenomenon was probably beyond the plan of this volume. We must not forget to mention the interesting peculiarities of the inferior surface of the basi-occipital, nor the minute canals sometimes found in its cerebral side.

This may suffice to give some idea of the thoroughness of the work. We must, however, refer the reader to the question of the variations of the pterion, for it serves as an introduction to the author's views. Referring to the process from the squamous portion of the temporal which occasionally reaches the frontal, he writes as follows: "In accord with Gruber, Calori, Virchow, Broca, etc., and in opposition to Anoutchine, Ranke and Schwalbe, I persist in considering the frontal process of the temporal an animal analogy (theromorphie). It does not seem to me necessary, in order to affirm its reversive nature, that this should be the normal arrangement in all the simians. It occurs in a large number of them and in many other animals, which seems to me sufficient; especially as in man it occurs most frequently in what are held the lower races." What makes this announcement doubly interesting is that Professor Le Double is not one of those who call every representation of a condition normal in some animal a reversion. This was one of the mistakes of the cruder days of evolution. On the contrary, he maintains, as we have, that similarity of certain parts is no proof of descent. This is true both when we deal with structures that are normal in a species and when we deal with such as appear exceptionally in individuals. What has long been a crucial point in our mind is whether we are justified in calling a peculiarity a reversion unless we can point out at least a plausible line of descent which shall lead us back to it, and which, moreover, shall not be at variance with the pedigree necessary to account in the same way for other anomalies. To say, as some do, that there is no way of tracing by descent some particular feature through the mammalia and that, therefore, we must call its occasional appearance a reversion to something still earlier is simply to beg the question. If what we have suggested be demanded, it seems that, at present at least, the difficulties presented by the theory of reversion are insuperable. Professor Le Double, judging from the above quotation, would hardly think such a demand justifiable. None the less he very judiciously recognizes other causes.

We do not write, however, for the purpose of discussion. Our object is instead to bring an excellent book to the notice of those interested in the subject. Had it no other merit than that of bringing together the observations that have been made in the last generation, it would be indispensable to anatomists who wish to study the deeper problems.

THOMAS DWIGHT.

HARVARD MEDICAL SCHOOL.

SCIENTIFIC JOURNALS AND ARTICLES.

The Botanical Gazette for January contains the following articles: 'A Morphological Study of *Elodea canadensis*,' by R. B. Wylie, brings out the general facts in regard to floral

development, the growth of the gametophytes, pollination and fertilization. Pollination is largely dependent upon the surface film of water. The functionless pollen tubes swell up into 'cystoids' in the ovarian cavity. These enlargements contain the male structures, still showing themselves as distinct cells instead of nuclei only. Double fertilization occurs and the oospore divides before the endosperm nucleus.—A paper on the 'Chemotropism of Roots,' by F. C. Newcombe and Anna L. Rhodes, records *Lupinus albus* roots as positively chemotropic toward disodium phosphate, no concentration of the salt producing a negative curve. Roots will bend into a solution strong enough to kill them. There is no evidence of osmotropism. Roots of *Cucurbita pepo* exhibit a general indifference to chemicals, showing no chemotropism even toward disodium phosphate.—'A Botanical Survey of the Huron River Valley,' by L. H. Weld, forms a second contribution to the botanical survey of this region undertaken under the direction of Professor Spalding. The paper gives detailed accounts of the soil and vegetation. The author's plan has been to give exact data, so that a comparative study may be made in the future by himself or others. Vegetation is considered largely from the dynamic standpoint.—'Southwestern Plants,' by L. N. Goodding, is a paper describing a number of new species, chiefly from southern Nevada and Utah.—W. C. Coker publishes a series of figures of the sprouting spores of *Equisetum*, showing great variation, and also describes spore distribution in liverworts.—J. B. Farmer explains his views of the quadripolar spindle in the Hepaticæ, in view of the fact that several late papers seemed to attack it.

The contents of *The Journal of Comparative Neurology* for December are as follows:

O. P. Jenkins and A. J. Carlson: 'The Rate of the Nervous Impulse in the Ventral Nerve-Cord of Certain Worms.'

O. S. Strong: 'Notes on the Technique of Weigert's Method for Staining Medullated Nerve Fibers.'

C. Judson Herrick: 'The Doctrine of Nerve Components and some of its Applications.'

B. F. Kingsbury: 'Columella Auris and Nervus Facialis in the Urodela.'

Editorials and reviews.

A monthly journal for teachers of mathematics, entitled 'School Mathematics,' edited by Messrs. George W. Myers and C. E. Lineberger has begun publication. It is a continuation of the mathematical supplement of 'School Science.'

Dr. Toulouse has become editor of the *Revue Scientifique*, the French weekly journal whose scope most nearly corresponds with that of *Nature* and of Science. Dr. Toulouse is director of the laboratory of experimental psychology at the Paris Ecole des Hautes Etudes and editor of the 'International Library of Experimental Psychology,' now being published in fifty volumes.

It is said that there will shortly be published at Paris a monthly journal devoted to radium and called *Le radium*.

SOCIETIES AND ACADEMIES.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

The 149th meeting was held on January 13, 1904. The following papers were presented in the regular program.

The Work of the Strassburg Seismological Congress: H. F. Reid.

Professor Reid, who was the official delegate from the United States, stated that the congress was held in response to a call from the German government to discuss the organization of an international seismological association. The congress was attended by official delegates from nineteen countries, and two others were unofficially represented.

The conference resulted in the determination of the form of an international seismological association, which will be submitted to all civilized nations of the world by the German government. The most important clauses of the constitution are as follows:

"The object of the association is the study of seismological problems, whose solution is only possible by the cooperation of many observatories in all parts of the world. The principal means of attaining this object are: (*a*) Observations according to common principles; (*b*) experiments on problems of special importance; (*c*) foundation and support of

seismological observatories in countries which need the pecuniary aid of the association; (*d*) organization of a central bureau for the collection, study, editing and publication of the reports sent from various countries.

"The members of the association shall be the nations which may join. They are to make the following annual contributions through the department of state at Berlin: (*a*) Nations with a population of less than five million, $100; (*b*) nations with a population between five and ten million, $200; (*c*) nations with a population between ten and twenty millions, $400; (*d*) nations with a population of more than twenty million, $800.

"The organs of the association are: (*a*) The general assembly; (*b*) the permanent commission; and (*c*) the central bureau.

"The general assembly shall consist of delegates from the nations which are members of the association, and is to meet at least once in four years. Delegates from scientific societies and other persons may be invited to attend the general assembly.

"The permanent commission shall consist of the director of the central bureau and one delegate from each nation.

"It shall elect from its own number its president, vice-president and secretary-general.

"The permanent commission shall have general control of the affairs of the association, and shall see that the resolutions of the general assembly are carried out. It shall also direct the method of expenditure of the funds of the association, which are to be used for: (*a*) Expenses of publication and administration; (*b*) salary of the secretary-general; (*c*) to subsidize theoretical work or experiments of exceptional importance which may have been ordered by the general assembly; (*d*) for the foundation and support of seismological observatories founded by the association, the observations of which are of general interest for the study of seismical phenomena.

"A financial account shall be published in the proceedings of the permanent commission.

"The central bureau shall be located at the imperial central seismological station at Strassburg, and the director of the latter shall be the director of the central bureau; the central bureau shall have the benefit of the assistants and resources of the central station.

"The central bureau shall collect the reports from the different countries, edit and publish them. The director of the central bureau shall present an annual report covering the whole work of the bureau, and shall also outline the work proposed for the following year.

"The secretary-general shall make a report to every general assembly on the work and condition of the association. He shall attend to the publication of the proceedings of the permanent commission, of the deliberations of the general assembly and of investigations undertaken by order of the association. He shall have charge of the general affairs of the association under the direction of the president of the permanent commission.

"The association shall be formed for a period of twelve years, beginning April 1, 1904. Nations which join the association may withdraw at the end of each period of four years, on giving six months' notice of their intention."

The next paper, entitled 'Experiments on the Pollution of Deep Wells in Georgia,' presented by Mr. M. L. Fuller, dealt with a practical experiment, conducted by the United States Geological Survey and the Geological Survey of Georgia, acting in cooperation, to determine the liability of contamination of the deep wells and springs in the vicinity of Quitman, Georgia, by the proposed action of that city in turning the public sewage into an underground stream through a bore hole. To test the matter the surveys mentioned inserted two tons of salt into the well into which it was proposed to turn the sewage. Samples of water were taken before the experiment to determine the normal chlorine of the waters, and at short intervals during and for some time after the experiment. On analyzing the samples it was shown that the salt had entered all of the deep wells in town, thereby demonstrating that the insertion of sewage would have contaminated all of the wells and possibly led to a dangerous epidemic.

Mr. Arthur J. Collier then presented a paper on 'The Tin Deposits of the York Region, Alaska.'

The York region occupies the western part of the Seward Peninsula, and has the form of a triangle, with Cape Prince of Wales, the most western point of the continent, at the apex, the Arctic Ocean and Bering Sea for the sides. The region has no harbor, and landings are made through the surf, but Port Clarence, a safe, deep harbor, lies twenty-five miles southeast.

The principal topographic features are the York Mountains, which occupy the southeast corner of the triangle, and the York Plateau, 200 to 600 feet high, surrounding these mountains on the south, west and north sides. Cape Mountain and Cone Hill are 'monadnocks' on this plateau, the former marking the westernmost point of land. Three sedimentary formations are recognized, forming irregular belts, which extend north and south. The York Mountains are composed of Silurian limestones. West of these is a belt of metamorphic slates of undetermined age, and beyond these is a narrow limestone belt probably of lower Carboniferous age. These sediments contain intrusive masses of granite and rhyolite, with which tin ore is associated, and greenstones which have no economic bearing.

The Lost River tin deposits are four or five miles from the coast in the York Mountains. The tin occurs in a greisen dike, about one mile long and 100 feet wide, which cuts the limestone and extends east and west. The rock consists of fluorite, calcite, quartz and lithia mica, with cassiterite, pyrite, galena, wolframite and garnet as accessory minerals. In a granite boss, south of this dike, some stannite was found.

On Cape Mountain, which is an intrusive granite boss, cassiterite, closely associated with tourmaline, has been found on the surface, at at least three distinct points. During the past year several short tunnels were driven into the mountain in search of the veins from which it was derived, but so far without success, though the granite is partially altered to greisen, and possibly carries small amounts of tin.

On Buck Creek, which lies twenty miles inland and drains into the Arctic Ocean, the ore occurs in the form of stream-tin. The alluvial deposits were exploited during the past season, and a number of tons of tin ore were mined and shipped. The stream-tin evidently came from small veins in the slates. No veins of this kind have been found in place, but specimens, showing their character, have been found in the gravels.

The placers on the Anikovik River and Buhner Creek, in which tin ore was found in 1900, have been abandoned, but all of the discoveries and developments noted date from that report.

ALFRED H. BROOKS,
Secretary.

THE CHEMICAL SOCIETY OF WASHINGTON.

THE 147th regular and the 20th annual meeting of the society was held on January 14 in the Assembly Hall of the Cosmos Club.

The annual reports of the treasurer and secretary were read and the following officers elected:

President—Dr. E. T. Allen.
First Vice-President—Mr. S. S. Voorhees.
Second Vice-President—Mr. L. M. Tolman.
Secretary—Mr. Atherton Seidell.
Treasurer—Mr. F. P. Dewey.
Additional members of the executive committee—Dr. W. T. Hillebrand, Mr. L. S. Munson, Dr. E. A. Hill and Mr. Allen Wade Dow.
Nominated to represent the Chemical Society as Vice-President in the Washington Academy of Sciences—Dr. Frank W. Clarke.
Representatives in the Council of the American Chemical Society, elected November, 1903—Dr. Henry N. Stokes, Mr. S. S. Voorhees.

A SPECIAL meeting of the society was held at 8 P.M., February 1, in the Chemical Lecture Hall of the Columbian University, to hear an address by Dr. Chas. B. Dudley, of Altoona, Pa., upon the 'Work of a Chemist on a Railroad.'

The speaker first briefly presented statistics of the equipment and annual expenditures of the Pennsylvania Railroad system. It appeared that up to the time of the establishment of the chemical laboratory of that railroad the supplies were bought solely upon the representation and reputation of dealers or manufacturers, but the work of the chemist has shown the necessity for critically examining all materials bought for the road.

The work of a railroad chemist divides itself into three main divisions, which are: (1) Experimental investigations to ascertain the requirements of the railroad, respecting different classes of supplies, and from such investigations the preparation of written specifications describing such requirements. The importance of this work for the future good to the road was emphasized. (2) The testing of supplies to learn if the quality of the material corresponds with that provided for by the specifications. (3) Difficulties or problems which other officers of the road, from lack either of time or of proper training, are unable to solve. A number of examples of such difficulties which came within his experience were described. The speaker concluded by assuring the young men present that the number of problems for the railroad chemist to solve was greater now than ever, and this field of work still offers very important opportunities for usefulness.

A. SEIDELL,
Secretary.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY GEOLOGICAL JOURNAL CLUB.

THE club reviewed the following articles during December and the first two weeks in January:

L. T. Buell, 'The Tin Deposits of the Malay Peninsula' (*Jour. Geol.*, February-March, 1903); H. A. Buff, 'Conditions in the Pennsylvania Anthracite Region' (*Eng. and Min. Jour.*, November 28, 1903); P. M. Paine, 'The Laurentian Peneplain' (*Jour. Geol.*, October–November, 1903); J. T. Glidden, 'Lead Resources of the United States' (*Eng. and Min. Jour.*, November 28, 1903); B. L. Johnson, 'Some Montana Coal Fields' (*Am. Geologist*, December, 1903); W. L. Spalding, 'The Ore Deposits of Tonopah, Nevada' (*Eng. and Min. Jour.*, November 21, 1903); W. L. Whittemore, 'Cobalt Mining in New Caledonia' (*Eng. and Min. Jour.*, November 28, 1903); R. H. Allen, 'Gold Mining in Rhodesia' (*Eng. and Min. Jour.*, December, 10, 1903); C. H. Clapp, 'The Wisconsin Zinc Fields' (*Eng. and Min. Jour.*, December 5, 1903); W. G. Ball, 'The Quicksilver Mines in Idria' (*Eng. and Min. Jour.*, December 17, 1903); C. E. Danforth, 'Asphalt Mining and Refining in the Indian Territory' (*Eng. and Min. Jour.*, December 17, 1903); C. W. Johnston, 'The Gold Placers of Bokhara' (*Eng. and Min. Jour.*, December 24, 1903); E. Burton, 'Age of Gypsum of Central Iowa' (*Jour. Geol.*, November–December); F. S. Elliot, 'Geology of the Apache Cañon Placers' (*Eng. and Min. Jour.*, December 24, 1903); M. Rubel, 'The Anthracite Conciliation Board' (*Eng. and Min. Jour.*, December 24 and 31, 1903).

The following original papers were read:

Professor W. O. Crosby, 'The Physiographic Geology of the Gold Regions of Alaska.' The paper was illustrated by several lantern views which were taken by Professor Crosby on his recent trip through Alaska. Professor W. H. Niles, 'The Life of Joseph Le Conte'; Professor A. W. Grabau, 'Rock Classification.' Professor Grabau presented a new system of classification which should include all the different kinds of rocks. His paper was discussed with very great interest and met with general approval. G. F. Loughlin described a granite-gneiss of central Connecticut. The igneous origin of this formation was proved by Mr. Lewis Westgate (*Jour. Geol.*, Vol. VII., No. 7, October, 1899). Mr. Loughlin reviewed Mr. Westgate's paper, and spoke of the fitness of the stone for building purposes. He attributed the tendency of the stone to stain on exposure to the minute grains of pyrite and microscopic garnets which are abundant in the rock. J. Daniels spoke briefly on the methods of taking sample borings and the uses made of them.

G. F. LOUGHLIN,
Secretary.

NEW YORK ACADEMY OF SCIENCES. SECTION OF BIOLOGY.

THE January meeting was held on the eleventh of the month, Professor Underwood presiding. Papers were read by Professor H. F. Osborn and Miss Adele M. Fielde.

Professor Osborn's paper, entitled 'The Classification of the Reptilia,' presented the history of the classification as follows: (1) Recognition of the Cotylosauria as the most

primitive group of reptiles, by Cope and Baur. (2) The separation of the Anomodontia, Chelonia and Sauropterygia as reptiles with a single temporal arcade, by Smith Woodward and Broom. (3) The affiliation of the Ichthyosaur with the two-arched rather than single-arched reptiles, by Baur and McGregor. (4) The recognition of *Sphenodon* as the ancestral type of the two-arched reptiles, by Baur and others. (5) Separation of the reptiles into two great groups of single-arched and two-arched types, by Smith Woodward and Broom. (6) The demonstration that reptiles are separated not only by the structure of the temporal arch but by many fundamental characters into two distinct groups, by Osborn and McGregor (1902). (7) Consequent division of the Reptilia into two subclasses Synapsida and Diapsida, by Osborn (1903). (8) The proposal of the Diaptosauria to include all of the most primitive two-arched reptiles without armature, by Osborn (1903). (9) The classification of the Reptilia according to the accompanying table (1903–4).

CLASS REPTILIA.

I. Subclass SYNAPSIDA, Osborn.
  1. Order COTYLOSAURIA, Cope [= Pareiasauria, Seeley].
    Family Diadectidæ.
    Family Pariotichidæ.
    Family Pareiasauridæ.
  2. Superorder ANOMODONTIA, Owen [= Theromorpha, Cope, in part].
    Order I. THERIODONTIA, Owen.
      Suborder I. Therocephalia.
      Suborder II. Cynodontia, Owen.
    Order II. DICYNODONTIA, Owen.
      Inc. Sedis.
    Order III. PLACODONTIA, Owen.
  3. Order SAUROPTERYGIA.
    Suborder I. Simosauria, Gervais [= Nothosauria].
    Suborder II. Plesiosauria.
  4. Order TESTUDINATA.
    Suborder I. Pleurodira.
    Suborder II. Cryptodira.
    Suborder III. Trionychia.

II. Subclass DIAPSIDA, Osborn.
  1. Superorder DIAPTOSAURIA, Osborn.
    Order I. PROCOLOPHONIA, Seeley
    Order II. PROTOROSAURIA, Seeley.
    Order III. PROGANOSAURIA, Baur.
    Order IV. GNATHODONTIA, Owen.
    Order V. PELYCOSAURIA, Cope.
    Order VI. CHORISTODERA, Cope.
    Order VII. RHYNCHOCEPHALIA, Günther.
  2. Order PARASUCHIA, Huxley.
    Suborder I. Aëtosauria.
    Suborder II. Phytosauria.
  3. Order ICHTHYOSAURIA, Blainville, 1835 [= Ichthyopterygia, Owen, 1839].
  4. Order CROCODILIA.
    Suborder I. Mesosuchia.
    Suborder II. Eusuchia.
    Suborder III. Thalattosuchia.
  5. Superorder DINOSAURIA, Owen.
    Order I. THEROPODA, Marsh.
      Suborder I. Megalosauria [= Thecodontia, Owen].
      Suborder II. Compsognatha, Huxley.
    Order II. OPISTHOCŒLIA, Owen [= Sauropoda, Marsh].
    Order III. ORNITHOPODA, Cope [= Predentata, Marsh].
  6. Superorder SQUAMATA.
    Order I. LACERTILIA.
    Order II. MOSASAURIA.
    Order III. OPHIDIA.
  7. Order PTEROSAURIA.

Miss Fielde's paper, on the 'Sense of Smell in Ants,' described her experiments with many species of these insects. Each species appears to have its distinctive odor, discernible by other ants. Within each species there are also differences of odor, dependent on the age of the colony and the age of the queen from whose eggs its inmates are produced. The ant's organs of smell are its antennæ, in which the joints are as a series of noses, each having a special function. The distal joint appreciates the nest-aura informing the ant whether it is in its own nest or in that of an enemy. The second joint discriminates between the odors of ants of the same species as itself, but of different colonies. The third joint discerns the scent of the track laid down by the ant's own feet, and enables the ant to return upon any route that has been previously traversed. The fourth and fifth joints smell the larvæ and pupæ, and the removal of these joints disables the ant from further care of the inert young. The sixth and seventh joints make known to the ant the presence of

ants of other species than her own. So many as five joints may be retained by ants whose antennæ have normally eleven or twelve joints, and these ants will live peacefully together though they be of different subfamilies. But if seven joints be retained, the ants, similarly grouped, will fight one another to the death. If ants make one another's acquaintance before they are twelve hours old they will thereafter live amicably together although they be of different species, genera or even of different subfamilies. But in three days after hatching their criterion of correct ant odor is established, and they refuse to affiliate with ants whose odor is not in accord with their standard.

M. A. BIGELOW,
Secretary.

THE TORREY BOTANICAL CLUB.

THE Torrey Botanical Club met at the New York Botanical Garden, January 27.

The first paper on the scientific program was by Dr. J. K. Small, on 'Recent Explorations in Southern Florida.' Dr. Small was accompanied on his trip by J. J. Carter, of Pennsylvania, and for a part of the time by A. A. Eaton, who paid special attention to the orchids and ferns. From Miami as a base expeditions were made in different directions. One trip was made to the northward in the direction of Ft. Worth. Four strikingly different plant formations were noted in this region: (1) Sand ridges covered with gnarled and stunted trees and shrubs mixed with cactuses with almost no grass or herbaceous vegetation, (2) low-lying moist lands covered with grass and sedges but destitute of trees and shrubs, (3) the pine lands, and (4) the hummocks filled with broad-leaved evergreens and deciduous trees. The country south of Miami is just being opened up to settlement and is still in a primitive condition. Most of the excursions were in this direction, explorations being made for a distance of forty-five miles. The region consists of low coral-limestone ridges with no appreciable soil, but still supporting a dense pine forest. The lower levels are filled with water and constitute arms of the everglades. The pine lands are interspersed with occasional small hummocks. An exceedingly interesting flora was found, and over a thousand numbers were collected, which include an unusual number of new and interesting things. So far as the collections have been studied, the plants from the hummocks show a close relationship to the Cuban flora and include a considerable number of West Indian species not heretofore known from the mainland. The pine-land plants, on the contrary, are largely endemic and include many undescribed species.

In the discussion which followed the reading of the paper it was stated that the expedition would probably add at least a hundred species to the known flora of the United States.

The second paper was by Dr. J. C. Arthur, on 'An Interesting Unpublished Work on the Fungi.' The paper will be printed in an early issue of *Torreya*.

The third paper was by Dr. N. L. Britton, on 'The Birch Trees of North America.' Recent study in arranging the dendrological exhibit in the museum has shown the necessity for a further investigation of our arborescent flora. In some genera, notably in *Fraxinus*, too many species are now recognized and some reductions will be necessary. In the birches, on the contrary, it is necessary to recognize at least four new species. One of these is in the Alleghany region, and the others are northwestern.

F. S. EARLE,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

CONVOCATION WEEK.

THE problem of cooperation and practical affiliation between the important scientific societies of the country and the American Association is one which, admittedly, is becoming each year more difficult of solution. The difficulty, moreover, is multiple and dependent on a variety of factors, rather than on one or two.

The consideration of expense, dependent partly on distance, is usually urged as the most important one, but this plea is not always sufficient. During the last convocation week it is known that many men in going to

Philadelphia spent more time and money than would have been required in going to St. Louis. The fact is, most scientific specialists will go where they expect to receive the greatest benefit, and not a few entertain the notion, apparently, that the special society with limited membership offers a better field for labor than the more democratic sections of the association. The difficulty in such cases might be obviated through the plan followed by the chemists. The American Chemical Society, which includes probably the whole of the membership of Section C, holds two meetings annually. By agreement made seven or eight years ago through committees from both organizations, one meeting of the Chemical Society is held each year in connection with that of Section C. The program of this meeting is a joint production; the officers of Section C preside through half the sessions and those from the society through the other half. This scheme has worked well from the beginning, and I have yet to discover that there is any tendency to make one of these annual meetings any more aristocratic or exclusive than the other. The plan works to maintain Section C in flourishing condition and gives a separate meeting for such chemists as may desire it, once a year.

To make any such arrangement permanently satisfactory one thing will be found necessary. The association will have to decide upon and publish its meeting places several years in advance. This will give the chemists and other special organizations an opportunity of planning properly for the intermediate or semi-annual meeting. Advance knowledge of this kind would make it possible to avoid an awkward situation like the one in which some of the societies now find themselves. The Chemical Society held a meeting in Philadelphia two years ago; other societies have just been there, and all those who are loyal to the association will expect to return there next winter. As individuals most of us would doubtless prefer to go to some place not so recently visited.

I, therefore, suggest that a committee from the association, perhaps the committee on policy, take the matter up and invite cooperation from the various societies. In this way it may be possible to prepare a program for four or five years ahead. The contingency of returning to the summer meeting, after the meetings at Philadelphia and New Orleans, of course, would have to be considered by this committee. It is not too early to begin work on such an advance program, which should be in shape for presentation at Philadelphia. Most of the interchange of views will have to be by correspondence, which consumes time.

Now, as to the continuation of the convocation week scheme. The Washington gathering was a great success for several reasons. The St. Louis convocation was not as satisfactory, and a number of factors operated to keep down the attendance. Bad weather was partly at fault, and many were doubtless kept away through the expectation of visiting St. Louis next summer. It is not fair to draw many conclusions from this occasion. For those organizations which, like the American Chemical Society, hold two meetings each year convocation week should be as convenient a time as any for the large general gathering. My personal preference would be for the last week in June, and this date, just after the commencement season, would doubtless suit most men from the schools of the west or middle west. But, on the other hand, the date is too early for men from some of the eastern schools. A September meeting is too late for some college men, and in August the temperature factor is usually against us, etc. Bringing up these points now is like threshing over old straw. I am, therefore, in favor of giving the winter meeting plan a trial long enough thoroughly to test its merits, which may require several years. In any event, I believe it is for the best interests of every scientific man in America to aid in building up and maintaining the power and influence of the association in developing lines of scientific work. The section scheme and convocation week bring us all together. Why not continue a good thing!

J. H. Long.

In regard to the question of the best organization of scientific societies, my experience

has been, if you will let me eliminate the word scientific, that the most flourishing societies are those where the governing body has been fairly permanent. By such means a stable organization and consistency of purpose are possible.

The great value to be derived from a discussion of this character is that from the various opinions presented some ideas will be offered that may be of service in improving the government of the American Association for the Advancement of Science. Therefore, I may at the outset say what every one connected with the association knows, that it has been continually experimenting, in the hopes of finding something that would give satisfaction to every one; but as that is an impossibility it should be accepted as such at the beginning. What is needed, therefore, is a consistent policy that will extend over a number of years, in order that the advantages of the existing policy may become apparent and sufficiently numerous to outweigh possible objections. For instance, it matters little to most of us whether the meetings are held in summer or during convocation week, but if they are held at one time, those who prefer the other time naturally criticize the change, and discontent is the result.

The council, which is the governing body of our association, should be a permanent organization, so far as possible, and changes should be limited to the new officers elected each year. What is needed, it seems to me, is more conservatism, that is, less disposition to change. Originally, this was provided for by making the past presidents permanent members of the council, but unless the meeting is held in some convenient place, the past presidents are apt to be conspicuous by their absence, or if they are registered at the meeting, they do not attend the council. The result has been that each year new men, many of whom are possessed of decided opinions and are unfamiliar with the traditions of the organization, have come into the council, and they have suggested innovations that seemed to offer advantages, which on experiment failed to manifest themselves. May I illustrate my point by a note that appeared in SCIENCE subsequent to the Washington meeting, written by one of the vice-presidents of the organization, who criticized the local committee for not having offered certain facilities which he deemed desirable; whereas, as a matter of fact, the local committee had distinctly made the very provision that he called for, but it was completely ignored by the visiting scientists. Had the gentleman who wrote the note been more regular in his attendance at the meetings, he naturally would have known that his wants had been anticipated, a fact that could readily have been ascertained by inquiry of the local secretary. Finally, it seems to me highly desirable that the affiliated societies should be represented on the council by men who should serve for a term of years.

In conclusion, so far as my experience is concerned, I venture the opinion that the most satisfactory form of organization is the one in which the governing body is changed each year only by a minority of its members.

MARCUS BENJAMIN.

TO THE EDITOR OF SCIENCE: The recognition by our leading universities of one week in the year as convocation week is an indication of the academic value put upon the work of our scientific and learned societies. No other cause could secure such recognition, and it behooves those who have the guidance of these societies to make the meetings worth attending.

A large attendance of those interested and competent to take a part is, I take it, next to honest work, the chief desideratum; otherwise publication would meet all reasonable demands. How to secure a good attendance, therefore, is the first question to raise. Is the first week of the new year the best time for the purpose? For most societies I assume that it is. But the Society of the College Teachers of Education, the latest affiliated group, finds itself unable to meet regularly with the American Association. In most states the state teachers' association meets during the Christmas holidays, and properly enough many of the college teachers of education are expected to be present. Attendance on two meetings within two weeks is a heavy task for the holiday time. Furthermore, the Department of Superin-

tendence of the National Educational Association meets annually in February, and many college teachers of education find it desirable to attend its meetings. Consequently the society plans to alternate between convocation week in January and the superintendents' meeting in February. It is very doubtful if the educationists could secure satisfactory attendance during convocation week unless the meetings were held in a very central location. Nevertheless, I feel that it is worth while occasionally, say every other year, to sacrifice something in order to come in touch with the other great societies. This object, however, would hardly be gained if other societies should act in the same manner, unless some agreement could be reached concerning the biennial sessions.

My suggestion is that once in two years all the societies meet in the same place, and that on alternate years the chance be given the affiliated groups to serve their various interests. The place of holding the biennial sessions should be on or near the trunk lines and have suitable hotel accommodations. In my judgment, too, much would be gained by returning biennially to the same place. It would tend to give the association a fixed home and, what seems to me of great importance, a permanent and reliable constituency.

James E. Russell.

Concerning the plan of holding our annual session in the winter and also of the conflicting interests of the association and the affiliated societies, it is perhaps too soon to give a decided opinion, but I have a strong impression that a definite plan separating the sessions of the association from those of the societies is necessary to the highest welfare of both. Unless something is done the affiliated societies will swamp the association.

My preference would be to have it generally understood that the affiliated societies make a special business of meeting during the convocation week, each one where it chooses, and that all come together in the summer, either the week before or the week after the National Educational Association, for a grand association meeting, which shall be scientific, technical and social, and where all papers will be delivered either before the general association or before the departments of the same. By such an arrangement every section would be a success, and there would be no serious conflict of interests, and the delightful social features of the association would be perhaps a prominent feature at the summer meeting.

In my judgment persons who claim membership in the American Association by virtue of membership in an affiliated society ought to pay something into the treasury of the association, or the affiliated society should pay for them. The present arrangement seems to me unfair and unjust.

At the present time the great body of people who would naturally be most interested in Section D have their special societies. Civil engineers, mechanical engineers, electrical engineers, architects and (including them all) the Society for the Promotion of Engineering Education; all these would naturally be more or less interested in the work of Section D. None of these societies are affiliated. They meet independently when they will, but they do not desire to conflict in any way with the American Association. In fact it may truthfully be said that the American Association looks at the matters which interest all engineers and teachers of engineering from a somewhat different point of view from that of the societies I have named, and consequently it has a distinct function and sphere of its own. Section D affords an opportunity for the members of all these societies to get together on a common platform.

C. M. Woodward.

PROFESSOR METCALF'S EVOLUTION CATECHISM.

To the Editor of Science: In Science of January 8, 1904, Professor Metcalf formulates (p. 75) a series of crucial evolutionary questions. It is undoubtedly true that 'much further observation' will be necessary to decide them, to the satisfaction of everybody, but it is not less evident that we have already a vastly larger body of evolutionary facts than we have adequately interpreted. In the belief that the problem is at present one of interpretation quite as much as of observation, I

venture brief replies to Professor Metcalf's questions, premising only that these suggestions are incidental to 'A Kinetic Theory of Evolution' outlined in SCIENCE of June 21, 1901, and in subsequent papers.

"Are there mutations which are distinct from fluctuating variations? Are fluctuating variations restricted to rather narrow limits, and are the larger variations which occur of a different sort, establishing a new mean about which a new series of fluctuating variations cluster?" Yes; mutations or spots which appear among inbred domesticated plants and animals differ from the 'fluctuating' individual diversity of unsegregated wild types in the amplitude or abruptness of the variation, and in a more or less pronounced reproductive debility. 'Fluctuations' and mutations are extremes of the same series of phenomena, but their evolutionary significance is very different. New types are built up through the interbreeding and accumulation of genetic variations, but mutations which depend for their existence on narrow segregation do not contribute to the evolutionary progress of species.

"Are mutations (or variations) definite or indefinite? Do they follow certain lines or do they occur in all directions?" Variations of both kinds occur in many directions. The idea that they exactly offset each other and thus maintain a stationary average has no warrant of observation and is opposed to the calculus of probabilities. Species tend to move in *some* directions, but not in all directions (Darwin), nor in one particular direction (Naegeli).

"If the direction of mutations (or variations) is wholly or in part predetermined, what are these predetermining factors? Are they internal (involved in the nature of the organism), or external (environmental), or both?" They are internal, but not predetermined. Organisms of the same descent under the same conditions give diverse mutations. Of their causes in detail nothing is known; mutations are, however, *induced* by persistent inbreeding. The direction or the extent of variation may also *depend* upon external conditions. A variation in the direction of larger size would not be able to develop without adequate food.

"Is there a tendency in mutants (or variants) to revert toward the condition of the parent stock?" Normal genetic variations are more vigorous and prepotent than their immediate relatives, but mutations tend to 'revert' when the abnormal inbreeding is remedied by crossing.

"Are mutants (or variants) of one sort more (or less) fertile or more (or less) vigorous when bred together than when bred with the parent stock or with mutants (or variants) of another sort?" Sustained vigor and fertility, and evolutionary progress, as well, depend on normal interbreeding (symbasis). Mutative varieties are, in general, rendered more vigorous by crossing with less inbred stock, but often at the loss of their peculiar characters.

"Does mutation (or variation) cause partial (or complete) segregation?" Mutations are sometimes completely segregated by sterility, perhaps also by cytological or other malformations which prevent the resumption of interbreeding, but such abnormalities have no general evolutionary significance.

"Are hybrids between mutants (or variants) of different sorts or between mutants (or variants) and the parent stock intermediate in character between the two parents, or do they follow wholly or chiefly one parent? If the latter, which parent is followed in the several kinds of crosses?" Crosses between different mutants or even between similar mutants of different descent tend to 'revert' to the parental type. In crosses between mutants and their immediate and equally inbred relatives the mutant is prepotent, but individuals of the parental type may be prepotent if of a sufficiently remote line of descent. When the divergence of descent is too great or too long-standing to permit a return to the ancestral form, or when the prepotency of the mutation is balanced, as it were, by the prepotency attaching to smaller degree of inbreeding of the form with which it is crossed, there result disjunctive or 'Mendelian' hybrids.*

* Further confirmation came to hand after this letter was sent in. Professor Davenport finds

The discussion of evolution has long since passed the stage when particular facts could be used to prove general conclusions. The difficulty with the current hypotheses of evolution through selection and mutation is that while apparently supported by some facts, they are as definitely contradicted by others; a theory which can accommodate both series of phenomena has a larger basis of probability than either. From the standpoint of the kinetic theory the rejection of selection as the actuating cause or principle of evolution does not require the denial of selective adaptation. The recognition, on the other hand, that mutations are not caused by environment, does not mean that they are definitely predetermined. The abrupt and striking but more or less sterile aberrations of heredity which occur under inbreeding do not show that evolution depends upon segregation. Neither do they afford evidence against the view that evolutionary progress goes forward through the gradual accumulation of lesser and more normal variations, independent of environment, but not beyond selective influence. The kinetic theory affords the explanation, hitherto lacking, of how selection produces adaptation. It does not set stationary organisms in motion, but it may, at times, determine which variation shall most affect the direction of the motion of the species.

O. F. Cook.

Washington, D. C.,
January 14, 1904.

(Science, N. S., 19: 112, January 15, 1904) that albino mice of mixed ancestry are more prepotent or less recessive than those of pure breed, a result contrary to that which should follow under the pure-germ-cell, character-unit theories of Bateson, Wilson and Castle. The improbability of these mechanical hypotheses was already evident, however, from the fact, known since the time of Darwin, that the crossing of two 'recessive' inbred 'mutations' may bring a return to the ancestral type. The tendency to disregard older data seems to indicate that the recent DeVriesian and Mendelian mutations of terminology are prepotent in closely segregated evolutionary investigations, but the ancestral facts are still vigorous and likely to reassert themselves whenever a wider intercourse of ideas is resumed.

THE ANIMAL PARASITE SUPPOSED TO BE THE CAUSE OF YELLOW FEVER.

In Science of January 1 there appeared a letter signed H. W. Robinson, which purported to be a defense of one of the members of the working party which I arraigned in my article under the above caption in Science of October 23, 1903.

In reference to this letter I beg to state that I am not expected to give any attention to what one has to say whose knowledge of the matter is second-hand, but that I am fully prepared to defend whatever I have written in my article, whenever any of the working party answers to my arraignment of its members.

J. C. Smith.

New Orleans, La.,
January 25, 1904.

SPECIAL ARTICLES.

A FISH NEW TO FLORIDA WATERS.

While dredging off the coast of Florida in 1902, the steamer *Fish Hawk* collected four specimens of a fish whose occurrence in that region was most unexpected and whose known distribution is thus extended in a most interesting direction. The fish in question is the snipe-fish or bellows-fish, *Macrorhamphosus scolopax* (Linnæus), which is common in the Mediterranean and has occasionally been found as far north as the southern coast of England, inhabiting depths up to 170 fathoms. The *Fish Hawk* specimens were taken at two stations in the Gulf Stream off Key West at depths of 98 and 109 fathoms, respectively.

There is one other known occurrence of this fish in American waters, recorded by Storer in the *Proceedings of the Boston Society of Natural History* for 1857 (Vol. VI.), a specimen having been found at Provincetown, Massachusetts.

H. M. Smith.

NOTE ON A RUBBER-PRODUCING PLANT.

Recent experiments have shown some interesting facts in regard to the products of *Picradenia odorata utilis*, Ckll., *Bulletin Colo. College Museum*, December, 1903, a plant belonging to the Compositæ and growing abundantly in the neighborhood of Buena

Vista, Colorado. Mr. F. R. Marsh, of Denver, first called my attention to the fact that the roots of one of our native plants contained rubber, and kindly supplied me with material for experiments.

The roots tested were found to contain from five to twelve per cent. of crude rubber. This product is soluble in carbon bisulphide and benzol; it burns, giving off a strong odor of rubber. Several tests were made which showed that powder made from the bark contained a much larger per cent. than that made from the whole root. The crowns, when cleaned, contained about the same per cent. as the roots; the wool-like material surrounding the crowns contained a small per cent., though it was not so elastic as that taken from the roots and crowns.

The stems and leaves contained a resin soluble in carbon bisulphide, but it was a brown inelastic mass and when burned lacked the characteristic odor of rubber. The seeds contained a resin that superficially resembled that found in the stems.

It is hoped that the occurrence of rubber in the permanent parts of this *Picradenia* and not in the parts lasting only through the season may add to our knowledge as to the use of this substance. A detailed report on the physiological structure of these roots will be made as soon as fresh material can be obtained.

WILMATTE PORTER COCKERELL.
COLORADO COLLEGE,

BOTANICAL NOTES.

PROGRESS IN FORESTRY INSTRUCTION.

IT is but a few years since American university professors have given serious attention to that department of botany which deals with trees, *i. e.*, forestry, and it is a good sign of a broadening view of the work of the university and its relation to the community that not only are courses in forestry now offered by a considerable number of colleges and universities, but in addition their professors are writing books on the subject. Trees are no longer regarded by the botanist as mere species having place in a scientific system of classification, and on a definite portion of the earth's surface. These facts are important; fully as important as they have ever been, but we have learned that these giant plants have other interesting relations. We have found it as interesting to study the biology of a pine or an oak as of a microscopic alga or fungus. How to grow a tree is as legitimate a subject of inquiry as how to grow a particular bacterium or saprophytic fungus. The ecology of the forest affords as many interesting problems as the study of the zones and belts of ponds and swamps.

A little more than five years ago Professor Green, of the University of Minnesota, prepared a little book under the modest title of 'Forestry in Minnesota,' of which an edition of 10,000 was published by the Minnesota Forestry Association. After about three years, this edition being exhausted, Professor Green prepared a second which was published as a bulletin of the Geological and Natural History Survey of Minnesota. He has now revised the book again, enlarging and making it more general, so as to adapt it to the whole of the United States. Its title is now more general also—'Principles of American Forestry'—and it bears the imprint of John Wiley. of New York.

The scope of the book may be learned from an enumeration of the principal chapter headings, as follows: 'The Tree and Tree Growth'; 'The Forest'; 'Forest Influences'; 'Forest Regeneration'; 'Propagation'; 'Forest Protection'; 'Rate of Increase in Timber Trees'; 'Uses of Wood'; 'Durability'; 'Forest Economics'; 'The Important American Timber Trees'; etc.

A single quotation from the chapter on forest regeneration will suffice to show at once the style of treatment and the considerable botanical interest that this study involves, as presented in this admirable book:

> Succession of tree growth is an expression sometimes used as though there were a natural rotation of trees on the land. There is nothing of the sort. Sometimes hardwoods will follow pine, or the pine the hardwoods, where the two were mixed at the time of cutting, and there was a young growth of one or the other kind which had a chance to grow when its competitor was removed. Where land is severely burned after being cut over, the trees that show first are gen-

erally the kind with seeds that float long distances in the wind, such as poplar and birch, or those having fruits especially liked by birds, such as the bird cherry, which is very widely distributed. These show first on account of getting started first. The pine and the other trees may come in later owing to their being seeded later, or owing to the later advent of conditions favorable to their germination and growth. It may happen in the case of burnt-over pine lands that pine seed is distributed over it the first year after it is burned, but owing to there being no protection from the sun, the young seedlings of white and Norway pine, which are very delicate, are destroyed. After a young growth of poplars has appeared, the pine seed may find just the right conditions for growth for a few years, and finally get ahead of the poplars and crowd them out, while in the meantime it is being much improved by the presence of the poplars which grow rapidly and force the pines to make a tall growth. On the other hand, however, the poplars, birches and other trees and shrubs, and even weeds, may sometimes make so strong a growth as to kill out the young pine seedlings if they are not sufficiently well established at the time the mature growth is cut.

AN ENGLISH EDITION OF SCHIMPER'S PLANT GEOGRAPHY.

For several years it has been known that an English edition of Schimper's 'Plant Geography' was in preparation, the work having been undertaken by Professor William R. Fisher, with the advice and consent of the author. 'The untimely death of the author in 1901, shortly after the translation was begun, robbed the English edition of modifications and improvements which he had intended to make,' so the text of the book is exactly that of the German edition of 1898. The book in its English dress is characterized by the beautiful typography, paper and binding of the Clarendon Press of Oxford, and is a thick octavo of 869 pages (as against 894 in the German edition), and four maps. The only changes noticed are the omissions of the key-page to the plate of rock vegetation (Fig. 487), and the new plate for Map IV. at the end of the volume. The latter is much coarser in the Oxford map, and while it is much more distinct, it is considerably less accurate on the whole, than the German map. The translation has been revised and edited by Dr. Percy Groom and Professor Balfour, and Dr. Groom has added a sympathetic sketch of Schimper's life work.

Charles E. Bessey.
The University of Nebraska.

SCIENTIFIC NOTES AND NEWS.

At the annual meeting of the Royal Astronomical Society on February 12, Ambassador Choate received the society's gold medal on behalf of Professor George E. Hale, of the Yerkes Observatory.

McGill University has conferred the degree of D.Sc. on Professor D. P. Penhallow, professor of botany at the university, and on John A. Low Waddell, a consulting engineer of Kansas City.

Lord Rayleigh has been created, by the German Emperor, a foreign Knight of the Prussian Order Pour le Mérite for sciences and arts.

Mr. F. E. Beddard, F.R.S., of the London Zoological Gardens, has been elected a corresponding member of the Imperial Bohemian Academy of Sciences.

The following have accepted positions on the permanent staff of the Station for Experimental Evolution of the Carnegie Institution, at Cold Spring Harbor: Professor C. B. Davenport, who will serve as director; Mr. Frank E. Lutz, who will make quantitative studies in animal variation; Mr. George H. Shull, whose work will be largely in plant breeding and the study of mutations in nature; and Miss Anna M. Lutz, who will serve as recorder and cytologist. The plans of the new building are now in the hands of the architects, Messrs. Kirby, Petit and Green, of New York City, and construction will commence as soon as the frost is out of the ground, so that the building may be in use next summer.

Dr. Charles J. Chamberlain, of the Department of Botany of the University of Chicago, has received from the Botanical Society of America a grant to defray the expenses of a trip to Jalapa, Mexico, for the

purpose of studying cycads. Assistant Professor Bradley M. Davis, of the same department, has received an appointment to a Carnegie table at the Zoological Station, Naples, for the spring of 1904.

Nature states that the Tanganyika committee (Professor Ray Lankester, Sir John Kirk, Sir W. Thiselton-Dyer, Mr. Boulenger and Dr. Sclater) has determined to send out another naturalist for the further investigation of the 'Tanganyika problem,' and Mr. W. A. Cunnington, of Christ's College, Cambridge, has been appointed for this purpose. Mr. Cunnington will leave for Tanganyika (*viâ* Chinde and Zomba) in March, and will pay special attention to the lacustrine flora of the lake, of which as yet little is known, but will not neglect other subjects relating to the lake basin.

DR. EDUARD ZELLER, emeritus professor of philosophy in the University of Berlin, celebrated his ninetieth birthday on January 22. Emperor William presented him with a portrait and an autograph letter.

PROFESSOR AUGUST WEISMANN'S seventieth birthday was celebrated in Freiburg on January 17, when, as we learn from *Nature*, a large and representative gathering assembled to do him honor. A bust by Kowazik, of Frankfort, subscribed for by biologists in various parts of the world, was presented in the name of the subscribers by Dr. H. E. Ziegler, professor of zoology at Jena; it is to be placed in the zoological institute of the university. A special number of the *Zoologische Jahrbücher*, containing papers by various naturalists, was presented by Professor J. W. Spengel, professor of zoology at Giessen, and from the Grand Duke of Baden Professor Weismann received the cross and star of Bertold I.

DR. ADOLPH FRANCK, of Berlin, known for his contributions to chemical agriculture, celebrated his seventieth birthday on January 20.

DR. JOSEPH JASTROW, professor of psychology and logic at the University of Wisconsin, has sailed for Europe to be absent until the autumn.

IT is said that Dr. Nicholas Senn, of Chicago, will have charge of the red cross work of the Japanese army.

A GRANT of $500 was given this year by the Rockefeller Institute of Medical Research to Dr. A. S. Warthin, professor of pathology in the University of Michigan, for his researches on the etiology of the anemias. The grant has been used for the establishment of a fellowship in pathology, to which Mr. H. Woltmann has been appointed.

MR. W. SAVILLE-KENT will shortly leave England to investigate and advise towards the further development of the pearl, shell and other fisheries pertaining to certain Polynesian Island properties.

IT is reported that M. Curie has declined the cross of the Legion of Honor offered him by the French government, because it has not also been offered to Mme. Curie.

PROFESSOR W. F. BARRETT has been elected president of the Society for Psychical Research, succeeding Sir Oliver Lodge.

DR. HERMANN M. BIGGS, of New York City, gave, February 15, one of the lectures on tuberculosis before the Henry Phipps Institute of Philadelphia, his subject being 'The Administrative Control of Tuberculosis.'

AT Trinity College, President David Starr Jordan will lecture on February 19, on 'Modern University Tendencies,' and on February 26, Professor Henry Fairfield Osborn, on 'The Evolution of the Horse.'

MR. FRANK CHAPMAN, of the American Museum of Natural History, gave a lecture, on January 24, before the Audubon Society at Sherry's, New York City, his subject being 'Travels of a Bird Lover.'

PROFESSOR ELWOOD MEAD, expert in charge of irrigation investigations for the United States Department of Agriculture, who also holds the chair of the institutions and practice of irrigation in the University of California, has left Washington, D. C., for California, where he will deliver his annual course of lectures on the 'Organization of the Irrigation Industry.'

UNDER the auspices of the West India Committee, London, Dr. John S. Flett read a

paper on February 9, on 'The Volcanic Eruptions in the West Indies'; on March 8, Sir Frederick Manson will read a paper on 'Tropical Diseases.'

The prizes in the gift of the *Journal of Tropical Medicine* for prize essays on subjects connected with tropical diseases have been awarded as follows: The Belilios prize of £10, presented by the Hon. E. R. Belilios, C.M.G., for the best article on 'The system of drainage and sewerage best suited for tropical climates,' has been awarded to Captain J. W. Cornwall and Major F. Smith. The Lady MacGregor prize of £10, presented by Lady MacGregor, for the best article on 'A critical examination of the practical value of anti-typhoid inoculation,' has been awarded to Major F. Smith. The Sivewright prize of £10, presented by Sir James Sivewright, for the best essay on 'Intestinal affections in warm climates,' was not awarded.

Joseph Priestley, the discoverer of oxygen, died at Northumberland, Pa., February 6, 1804. On February 7, 1904, the Unitarian Club of Washington held a meeting to commemorate the centenary of that event. The speakers were F. W. Clarke, on Priestley as a discoverer; Rev. U. G. B. Pierce, who discussed Priestley's religious career, and the Rev. Edward Everett Hale, who spoke of Priestley's connection with America.

Dr. David Duncan, having been entrusted by the late Mr. Herbert Spencer with the writing of his biography, will be obliged to persons who may possess letters from him of value if they will kindly lend them to him for the purpose of such biography. All letters addressed to Dr. D. Duncan, care of H. R. Tedder, Esq., secretary, the Athenæum, Pall-mall, London, S. W., will be carefully preserved and returned in due course to their owners.

Dr. Charles Emerson Beecher, professor of historical geology at Yale University and a member of the governing board of the Sheffield Scientific School, died suddenly from heart-disease on February 14.

Mr. W. B. Powell died at Mount Vernon, New York, on February 6, at the age of sixty-seven years. Mr. Powell was for many years superintendent of schools in Illinois and occupied this position at Washington, D. C., from 1885–1900, where he introduced many reforms. He was a brother of J. W. Powell, the late eminent anthropologist.

There will be on March 1 a civil service examination to fill the position of pharmacologist in the Bureau of Plant and Animal Industry, U. S. Department of Agriculture, at a salary of $800 a year. On March 2 and 3 there will be an examination for miscellaneous computer in the U. S. Naval Observatory, the salary of the position amounting to from $800 to $1,000 a year. On March 16 and 23 there will be examinations for the position of aid in the National Museum in the Division of Fishes and in the Division of Birds' Eggs, with salaries of $600 and $540 a year, respectively.

Mr. Samuel H. Scudder has given to the Boston Society of Natural History his private library of nearly eight thousand pamphlets and volumes. This addition makes the society's collection of entomological works one of the foremost in the country.

The New York Evening *Post* states that Professor J. Laurence Laughlin, of the University of Chicago, has been authorized by a Chicago business firm to offer four prizes for the best essays on topics relating to commerce and industry. The first prize will be $1,000, the second $500, the third $300, and the fourth $150, and any person who has received the degree of bachelor of arts from an American college since 1893 is eligible to compete. The essays are to be judged by Professor Laughlin; Professor Clark, of Columbia University; Professor Adams, of the University of Michigan; Dr. Carroll D. Wright, of Washington, and Horace White, of New York.

At the ordinary quarterly *comitia* of the London Royal College of Physicians, held on January 30, the President, Sir William Church, announced that Dr. Horace Dobell, of Dorset, had presented a sum of £500 in cumulative consols to the college for the promotion of original research into the ultimate origin, evolution and life history of bacilli

and other pathogenetic microorganisms. The conditions are that the president and censors of the college shall select a lecturer once in every two years, who shall give a record of original researches on the above subject, made by himself and others, and that he shall receive a fee of £50 for so doing. These lectures are to be continued biennially, as long as a sufficient amount of the £500 and its accumulated interest remains. The first lecture will be delivered during the year 1904.

AT the recent meeting of the Society for Psychical Research, it was announced that the sum of $30,000 had been collected for a scholarship, which it was hoped would be increased to $40,000. The English society now numbers 832 members, and the American Society 530 members.

THE Philadelphia Neurological Society celebrated its twentieth anniversary on January 27 by a dinner at University Club. Speeches were made by Dr. S. Weir Mitchell, Dr. E. C. Spitzka, Dr. George Lincoln Walton, Dr. Wharton Sinkler and Dr. Charles K. Mills.

THE annual meeting of the American Institute of Mining Engineers, which was to have been held in Baltimore from February 16 to 20, has been called in Atlantic City, N. J., owing to the Baltimore fire.

A CONGRESS for experimental psychology is to be held at Giessen, beginning on April 20.

THE tenth Congress of Polish Physicians and Scientific Men will be held at Lemberg, Austrian Poland, on July 20–24, 1904. Professor E. Machek is chairman, and Professor W. Sieradzki is secretary of the committee of arrangements.

THE British parliamentary committee on physical deterioration is now holding sittings. Evidence has been given by Dr. D. J. Cunningham, professor of anatomy at the University of Edinburgh and chairman of the anthropometric committee of the British Association, by Sir Lauder Brunton, M.D., F.R.S., Mrs. H. G. Close, Mr. J. B. Atkins, London editor of the *Manchester Guardian*, Dr. Edward Malins, president of the Obstetrical Society and others.

A PETITION is being extensively signed in Great Britain in support of the bill for the adoption of the metric weights and measures which will be introduced in the house of lords by Lord Belhaven, and seconded by Lord Kelvin.

AN industrial and agricultural exposition is to be held at Nantes during the present year, beginning on May 5 and ending on September 22. The exposition is to be international in character and is to comprise four sections—agriculture, industry, marine and fine arts.

THE Davenport Academy of Sciences gave during January and February a course of seven lectures as follows: 'Some Interesting Features of Insect Life,' by Dr. L. O. Howard, Division of Entomology, Washington, D. C.; 'Protective Coloration among Animals,' by Professor C. C. Nutting, University of Iowa; 'Alamogorda, A Problem of the Desert,' by Professor Thomas H. Macbride, University of Iowa; 'Sanitary Engineering,' by Professor Charles S. Magowan, University of Iowa; 'Man in the Tropics,' by Professor Bohumil Shimek, University of Iowa; 'The Geology and Scenery of the Pipestone Region,' by Professor Samuel Calvin, University of Iowa.

THE U. S. Geological Survey has published a paper on 'Chemical composition of igneous rocks, expressed by means of diagrams, with reference to rock classification on a quantitative chemico-mineralogical basis,' by Professor J. P. Iddings, of the University of Chicago. The materials erupted from the depths of the earth vary greatly in composition. Silica, alumina, iron, magnesia, lime, soda and potash are present in considerable amounts in most eruptive rocks, and other substances often occur in notable quantities. The mineralogical composition and, through that, various other features of igneous rocks, depend in large degree upon the chemical composition of the fluid magmas of which they represent the solid forms. It is, however, difficult, even for the specialist in this science, to perceive readily the significance of the differences in composition between two rocks when presented in the form of long chemical analyses; hence petrographers have for many years sought to express in the form

of some diagram the principal facts of each analysis, so that they may at once appeal to the eye. Professor Iddings describes the various kinds of diagrams that have been used, finally explaining the kind which seems to him the most useful. These diagrams express the relations of all the leading constituents of an analysis. Professor Iddings has also devised a plan for the comparison, upon charts, of diagrams representing separate analyses, so that the full range of composition found for known igneous rocks is at once illustrated. This publication presents these charts, which are printed in four colors and accompanied by descriptive text. This graphic representation brings out many facts concerning the composition of the earth's magmas. The fact that there are no well-defined chemical groups of rocks, but rather a continuous series with no natural dividing lines, is clearly illustrated. The author discusses the relations exhibited by the charts, with particular reference to rock classification.

UNIVERSITY AND EDUCATIONAL NEWS.

Columbia University, the Massachusetts Institute of Technology, the Lawrence Scientific School of Harvard University and the Sheffield Scientific School of Yale University will unite in a summer school of mining to be held in Colorado. The conduct of the summer school is to be in the hands of an executive committee, consisting of Dr. John Hays Hammond, representing Yale University; Professor Robert H. Richards, of the Massachusetts Institute of Technology; Professor Henry L. Smyth, of Harvard University, and Professor Henry S. Munroe, of Columbia University. The last named has been appointed director of the school for the first year, and he will have under him a corps of competent instructors drawn from the several institutions. Mr. George Crocker, through Professor John Hays Hammond, has offered to pay the cost of the school this summer, and has placed $12,000 for this purpose in the hands of Mr. Hammond and the presidents of the four institutions named, who will act as trustees of the fund.

The new science and administration building of Colorado College, at Colorado Springs, known as Palmer Hall, will be formally opened with various celebrations during the latter part of the month. The dedicatory address will be delivered on February 23, by Dr. David Starr Jordan; on February 22 addresses will be delivered by Dr. C. R. Van Hise, Dr. S. L. Bigelow, Dr. C. E. Bessey and Dr. Henry Crew. The new building has been erected at an expense of $280,000, and contains ample laboratory facilities for the scientific department, a museum, etc.

A number of influential heads of colleges and professors at Oxford have issued a leaflet urging that candidates for honors in mathematics and natural science shall be allowed to substitute for the entrance examination in Greek, mathematics, a science or a modern language.

Henry S. Williams, since 1892 professor of geology in Yale University, where he was called from Cornell University, has accepted a call to the head of the department of geology at Cornell.

Dr. W. R. Whitehorne, formerly professor of physics and chemistry at Muhlenberg College, Allentown, Pa., has been appointed instructor in physics at Lehigh University.

Dr. Waldemar Koch, associate in pharmacology in the University of Chicago, has resigned to accept the assistant professorship of pharmacology and physiological chemistry in the University of Missouri.

Dr. George Byron Gordon has been appointed instructor in anthropology in the University of Pennsylvania.

Dr. W. S. Bayley has resigned the chair of mineralogy and geology at Colby College which he has held since 1888.

Professor Charles H. Haskins, of the mathematical department of the Sheffield Scientific School, Yale University, has resigned because of impaired health.

Dr. Bonnhöfer, of Königsberg, has been elected professor of psychiatry and director of the Insane Asylum at Heidelberg.